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REVIEW AND SYNTHESIS OF RESEARCH IN TRADE AND INDUSTRIAL EDUCATION.

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PERIODICALS, BOOKS, PAPERS, DISSERTATIONS, AND RESEARCH REPORTS FROM 1954 TO 1966 WERE REVIEWED IN ORDER TO ESTABLISH A BASE FOR CURRENT RESEARCH. THE TOPICS REPORTED ON ARE (1) PHILOSOPHY AND OBJECTIVES, (2) MANPOWER NEEDS AND EMPLOYMENT OPPORTUNITIES, (3) CURRICULUM DEVELOPMENT, (4) EDUCATIONAL PROGRAMS, (5) INSTRUCTIONAL MATERIALS AND DEVICES, (6) LEARNING PROCESSES AND TEACHING METHODS, (7) STUDENT PERSONNEL SERVICES, (8) FACILITIES AND EQUIPMENT, (9) TEACHER EDUCATION, (10) ADMINISTRATION AND SUPERVISION, (11) EVALUATION, AND (12) RESEARCH. (EM)

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Review and Synthesis of Research in

TRADE and INDUSTRIAL EDUCATION

THE CENTER FOR VOCATIONAL AND TECHNICAL EDUCATION
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The Center for Vocational and Technical Education has been established as an independent unit on The Ohio State University campus with a grant from the Division of Adult and Vocational Research, U. S. Office of Education. It serves a catalytic role in establishing a consortium to focus on relevant problems in vocational and technical education. The Center is comprehensive in its commitment and responsibility, multidisciplinary in its approach, and interinstitutional in its program.

The major objectives of The Center follow:

1. To provide continuing reappraisal of the role and function of vocational and technical education in our democratic society;

2. To stimulate and strengthen state, regional, and national programs of applied research and development directed toward the solution of pressing problems in vocational and technical education;

3. To encourage the development of research to improve vocational and technical education in institutions of higher education and other appropriate settings;

4. To conduct research studies directed toward the development of new knowledge and new applications of existing knowledge in vocational and technical education;

5. To upgrade vocational education leadership (state supervisors, teacher educators, research specialists, and others) through an advanced study and in service education program;

6. To provide a national information retrieval, storage, and dissemination system for vocational and technical education linked with the Educational Research Information Center located in the U. S. Office of Education;

7. To provide educational opportunities for individuals contemplating foreign assignments and for leaders from other countries responsible for leadership in vocational and technical education.

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REVIEW AND SYNTHESIS OF RESEARCH IN TRADE AND INDUSTRIAL EDUCATION

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INTRODUCTION

In keeping with The Center's responsibility for stimulating and facilitating research in vocational and technical education and its commitments to information retrieval and dissemination, this Review and Synthesis of Research in Trade and Industrial Education has been developed. The stimulus for this paper evolved from the recognition of need for establishing a base or "benchmark" for current research efforts and for the national information retrieval and dissemination system being developed by The Center and linked to the Educational Research Information Center in the U.S. Office of Education.

This review paper should aid researchers and practitioners in assessing the current state of the art in research for the field of trade and industrial education. Further, it should assist in identifying voids in our present research framework and help "sharpen" future studies, both in terms of their substantive focus and methodological approaches. It is logical to assume that this compact review should also assist practitioners in accelerating the applications of research findings to current practice in vocational and technical education programs.

It is recognized that since the ERIC network and its information retrieval and dissemination system was not yet operative when this paper was prepared, the review is subject to gaps and that, in the main, the paper does not reflect the rapidly evolving findings

generated by funds available through Section 4(c) of PL 88-210. Admittedly, the authors had problems in securing all available material, but nevertheless, in our judgment, they have done a splendid job of "pulling together" the significant research in the area.

This paper is one of seven published by The Center dealing with research in a substantive area of vocational and technical education. Other research review papers include: Business and Office Education; Distributive Education; Home Economics Education; Industrial Arts Education; Technical Education; Agricultural Education.

Through The Center and the ERIC Clearinghouse for Vocational and Technical Education, it is anticipated that in the immediate future, other research review and synthesis papers will be developed to assist the profession in assessing an updated "state of the art" and of the potential impact of research on educational practice.

We are indebted to Bruce W. Tuckman and Carl J. Schaefer for their scholarship and efforts in providing the profession with this new benchmark and perspective on research in trade and industrial education. Recognition should be given to Dr. Melvin Barlow, Director, Vocational Education, School of Education, University of California, Los Angeles, California, for his critical review and helpful suggestions for refining the manuscript prior to publication. Acknowledgment is also due Dr. Virgil E. Christensen, of The Center staff, for coordinating the work of the several authors.

Final acknowledgment is given to Dr. Calvin J. Cotrell, Specialist in Trade and Industrial Education, at The Center, for his review and assistance in the development of this publication.

We solicit the suggestions and comments of the profession for improving these publications.

Robert E. Taylor
Director

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PREFACE

For purposes of this review, the following definition of Trade and Industrial (T & I) Education, as set forth in the American Vocational Association publication on definitions, has been adopted:

> . . . instruction which is planned to develop basic manipulative skills, safety judgment, technical knowledge, and related occupational information for the purpose of fitting persons for initial employment in industrial occupations and upgrading or retraining workers employed in industry.

Individuals so trained, according to the U.S. Department of Health, Education, and Welfare (1958), will engage in occupations concerned with designing, producing, processing, assembling, maintaining, servicing, or repairing of any product or commodity.

An attempt has been made to restrict the materials reviewed to research studies involving the collection of data and comparison either between groups or correlation of pieces of data for the same group. In some cases, studies containing only descriptive data for a single group have been included. Finally, articles presenting an author's opinion have been included only in instances where the opinion appears to be supported by documentation. Sources ranging from books, journals, and dissertations to papers presented at meetings and unpublished studies have been utilized. Many of these unpublished documents have come directly from State Supervisors of Trade and

Industrial Education and from Chairmen of University Departments of Trade and Industrial Teacher Education.

The reviewed articles have been chosen primarily from the years 1962-1966. In some cases, articles from the 1960-1961 period have been included. Studies appearing prior to 1960 have not been included.

The authors would like to express their appreciation to Dr. John L. O'Brian who provided materials relevant to recent research in T & I Teacher Education, Mr. Seth Goldberg who abstracted many of the articles contained in the review, Mr. Benjamin Shapiro, Director of the Rutgers Curriculum Laboratory, who made available many of the journals reviewed, and Mrs. Virginia Fanos who typed the final manuscript. The authors are further indebted to those T & I administrators and educators who responded to requests for unpublished research reports, thus increasing the inclusiveness of this literature review.

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PHILOSOPHY AND OBJECTIVES

The highlight of the period 1962-1966 in vocational education was the passage of the Vocational Education Act of 1963. Prior to its passage, Chase (1963) contended that the preoccupation of American education with the 20 per cent of this country's youth who complete a college education has resulted in a situation wherein the remaining 80 per cent are "learning to be unemployable." The solution to this problem lies in vocational education becoming more flexible, gaining more support from organized labor, offering programs more in line with employment opportunities, expanding programs such as the work-study program, including more youth with special needs, and receiving more federal funds. The Report of the Panel of Consultants on Vocational Education (U.S. Department of Health, Education, and Welfare, 1963) also cited vocational education as being insensitive to supply-and-demand factors in the labor force, as being unavailable in many schools, in providing only limited offerings, in serving the urban population only meagerly, and in contributing less than its need, particularly in the case of youth with special needs.

Studies such as the above stimulated the passage of the Vocational Education Act, which represents a philosophy in itself. As it was being signed into law, Eddy (1963) speaking as the "Spirit of Vocational Education," said:

> . . . Reject not the principles of the prophets which have served well over the years, but recognize that the limited practices of yester-years are not

> sufficient unto this day. Change cometh of swift feet, and is always at hand. . . . Widen ye your vision. Be alert, that new needs will be recognized, and become flexible that they be satisfied. . . . For it is in meeting the needs of man, fashioned to the opportunities of the day and those to come, that the general welfare, the defense of the nation, a sound economy, and stable social institutions are maintained. . . . Be also concerned about an organization for the work. But think not that one plan must over-shadow all the others. . . . Search yourselves diligently lest you continue to neglect the hosts of men who have not been served well in the past. . . . Be not afraid to investigate all matters that Truth will be known. Experimentation and research are the mightiest of tools for this endeavor. . . . (p. 19, 20)
> (italics his)

Emphasis on the extension of vocational programs to cover more students and more offerings was supported by Righthand (1964) who said the theme for the future must be "generalizability." When the 64th yearbook of the National Society for the Study of Education was devoted to Vocational Education, Walsh and Selden (1965) stated:

> A major objective of trade and industrial education is the orderly development of occupational skills, technical knowledge, safety attitudes, work attitudes, and practices required to enter employment at a productive level with the necessary educational background to move ahead within the occupation and its related areas. (p. 93)

They too identified the critical issues as being vocational education for all who need it, programs both broad enough and deep enough to provide the individual with flexibility, matching programs to present and emerging occupations, and developing adequate facilities and talented, broad-gauged leadership in the T & I area. This echoed the sentiments of Swanson (1964) who identified the nine "big problems and great opportunities for vocational education leadership," among which were emphasis and imaginativeness in programs for youth with special needs, teacher training, guidance and counseling, research, curriculum

development, and image-building. Willis (1962) also pointed up the need for vocational education to focus on programs for youth with special needs as well as programs for out-of-school youth and adults who need retraining.

McDowell (1965) had administrators, supervisors, teacher educators, and employers (all in the T & I area) rate 60 statements dealing with the philosophy and objectives of trade and industrial education. Responses indicated that course offerings should be flexible, counseling extensive; training should be provided for out-of-school youth and adults, and the public should be wooed and won over to the cause.

These, then, are the guidelines and the mandate. Serve more youth with more programs which reflect the needs of the labor market. If vocational education is preparation for the world of work, then it should provide for all who need it and it should lead to employment. As stated succinctly by Venn (1964) in his seventh recommendation:

> High schools should establish vocational education programs which offer <u>all</u> youth leaving high school marketable occupational skills or preparation for further occupational education. (p. 166, 167) (italics ours)

MANPOWER NEEDS AND EMPLOYMENT OPPORTUNITIES

National Opportunities and Projections

The <u>1966 Manpower Report of the President</u> (U.S. Department of Labor, 1966a) reported that the total labor force for 1965 was up 1.8 per cent over 1964 and that recent job growth has, in large part, been spurred by the goods-producing and related industries, notably manufacturing and construction. Much of the growth is accounted for by

the expansion of blue-collar employment (craftsmen, operatives, and laborers). Employment of both teenagers and youth 20-24 years old increased as well (primarily for white rather than nonwhite youth). The report further documented the position that a shortage of skilled workers is imminent and can, in part, be avoided if more use of Negroes and women is made in the skilled labor market. This projected upsurge in employment opportunities for skilled workers is further documented in other publications of the U.S. Department of Labor (1960, 1966b). Projected growth of manufacturing and construction industries accounts in part for the anticipated expansion of blue-collar jobs. Of the three blue-collar categories, the greatest job growth is expected for skilled craftsmen, with operatives showing slight to moderate job gains, while opportunities for unskilled employees grow only proportionately to the labor force as a whole.

A primary reason that only limited job growth is anticipated for operatives and laborers is the increasing appearance of automated techniques in goods production. The U.S. Department of Labor (1965, 1966c) reported that computerized instrumentation systems are becoming more prevalent in industry, that highly advanced systems are appearing with greater frequency in the metalworking industries which control metal cutting and metal forming tools, that textile, meatpacking, coal, construction, lumber, printing, and other industries using fabricating operations are becoming increasingly mechanized and that computerized systems for numerical control of machine tools have been developed to the point of practicality. Pragan (1965), speaking from the vantage point of organized labor, anticipated an expansion of jobs for the skilled at the expense of the unskilled as a function of automation.

Projections of future manpower needs for skilled craftsmen, as reported in the Manpower Report of the President, influenced the panel of consultants on vocational education and affected their recommendations (cf. Arnold, 1964). The recommendation for more programs and a greater inclusion of nonwhite youth and women reflect this anticipated blue-collar job growth.

Our Special Problem: Youth

Each year a larger number of youth join the labor force than in the preceding year, according to the U.S. Department of Labor (1966a). Moreover, the present unemployment rate of 13.1 for teenage males far exceeds the national average for the labor force as a whole. Forty-five per cent of the 16-21 year-old youth out-of-school in 1963 had not completed high school; of the nonwhite out-of-school youth, three out of every five lacked a high school diploma. The unemployment rate for drop-outs was almost twice as high as that for high school graduates. Leonard (1963) anticipated that 70 to 80 per cent of the young people will be unemployed in 20 years if the present rate continues. At present, Leonard's figures show that 30 per cent of the high school drop-outs are unemployed and 15 per cent of the high school graduates are unemployed. However, only five per cent of those who are graduated from trade schools are unemployed. The solution seems clear. The National Education Assocation (1963a) reported that the median annual income for high school graduates in the early 1960's was over $5,000 as compared to only slightly over $2,000 for those with no high school education, and between $3,000 and $4,000 for those with some high school education. The data seems to indicate, as Leonard (1963) contended, that we are "cheating 20 million students."

Women in the Labor Force

According to statistics released by the Women's Bureau of the U.S. Department of Labor (1963), 34 per cent of the labor force in 1962 were women. Of these, 15 per cent were employed as operatives in the manufacturing industry (primarily needle trades and textiles, electronic and electrical equipment, and airplane manufacturing). Only one per cent were craftsmen or foremen. Of the 25 most frequent occupations pursued by women, sewers and stitchers in manufacturing enterprises ranked eighth, laundry and dry cleaning operatives 15th, assemblers 16th, apparel and accessory operatives 17th, cosmetologists 18th, packers and wrappers 19th, checkers, examiners, and inspectors 23rd, and practical nurses 24th. Of the students enrolled in high school day T & I programs, 11 per cent were girls; in general continuance T & I programs, 37 per cent were female. Most of the female students were in needle trades (27 per cent) or cosmetology (21 per cent) programs, with 11 per cent in food trades programs.

Opportunities and Projections by States

Fullmer and Green (1963) reported that the demand for skilled workers in the State of Georgia will increase by 26 per cent during the period 1962-67. Each year 5,441 new jobs are expected to become available. Greatest increases are expected in construction and durable goods manufacturing industries. Considering the extent of present training programs in Georgia, a deficit of 7,100 skilled workers is expected by 1967 in the State.

Warner (1962) reported that the demand for skilled workers in the State of Missouri will also increase during this decade and that the

output of trained skilled workers in the State is expected to increase at only about one-third the rate of new employment demands. Job outlooks are especially good for automobile mechanics and repairmen, machinists, millwrights and tool and die makers, carpenters, plumbers and pipefitters, and electricians.

The State of New Jersey (1961) anticipated that the demand for craftsmen will almost triple during this decade, going from six per cent of the state's labor force to 17 per cent. All non-agricultural industries are expected to participate in the boom which will cause the labor force in New Jersey to grow to a point exceeding the national average by four per cent in 1970. While the need for trade craftsmen, mechanics, and repairmen is expected to show the greatest expansion, the demand for semi-skilled workers in the state is also expected to double by 1970.

The Ohio Department of Education (1957) reported that more than 40 per cent of those employed in Ohio were craftsmen and technicians, while only 3.4 per cent of the state's high school students were enrolled in T & I programs (as compared to 84.9 per cent enrolled in college prep and general programs). One can reasonably expect a deficit in trained skilled workers by the end of this decade.

Finally, Morine, Nangle, and Burke (1964) reported that some 165,000 additional skilled workers will be required in New England by 1970. Currently, the region's schools graduate 10,000 students a year from their T & I programs. Since the yearly need for both replacement and expansion is expected to be 16,500, the region will fall short by 6,500 craftsmen a year. In this region, as in the above states and the nation as a whole, the present supply capability

of the vocational education system (and industrial training programs) for skilled workers will not be able to provide for the increasing demand brought about by the anticipated industrial expansion of the decade.

CURRICULUM DEVELOPMENT

Before a training curriculum can be set forth, one must first identify the objectives that the training is intended to meet. As Weller (1966) said quite clearly:

> . . . How can details of training be worked out until training objectives have been defined? And how can training objectives be defined without drawing up criterion behavior tests? . . . You've got to have some goal in mind when you devise training schemes. . . . This means that the trainee's required performance at the end of any training course must be laid down in black and white. What tasks will he be able to carry out? What questions will he be able to answer? What challenge will he be able to meet? . . . (p. 59)

The Structure of Curricula to Provide Transferability

Primary among the objectives which recent research has identified for vocational T & I curricula is that it provide the student with skills which are transferable from one situation to another. The U.S. Department of Labor (1960) reported that in a recent year eight million workers made 11 1/2 million job changes. Moreover, the Department also reported (1964) that the tendency was greater in 1961 than in 1955 for job changes to occur between jobs in the same occupation and industry. The National Education Association (1962) pleaded the following:

> . . . Therefore, to the extent that the school tries to develop employable skills, it should aim at

> transferable skills, and it should not attempt to train persons for specific jobs that are only temporarily open. (p. 41)

To this end, Altman (1966) undertook to factor analyze test item scores on performance tests for a variety of different skilled jobs. This resulted in the identification of six general vocational capability areas: mechanical, electrical, spatial, chemical and biological, symbolic, and "people." Combining these with a series of psychological processes involved in work operations such as sensing, detecting, decision-making, etc., he generated a matrix of vocational capabilities by psychological processes, representing a framework for the vocational capabilities domain. It provided a scheme for identifying underlying job similarities in terms of overlap of general capabilities required. This served as the basis for generating curricula to provide students with the general capabilities required to perform a "family" of jobs.

The above approach is not unlike that of Maley and Frantz (1965) who described the "cluster concept" which is aimed at the development of skills and understandings related to a number of allied fields. The person is trained to enter a family of occupations (e.g., construction trades cluster). The curriculum provides the students with skills and competencies which are common to all occupations in the cluster. These are determined by analyzing performances required in an occupation into such capability areas as communications, measurement, skills, math and science, and information.

Olivo (1964) recommended that curricula be built along five dimensions. The first, vertical coordination, is similar to the cluster concept of Maley and Frantz. The common elements of a family

of occupations form the basis for the curriculum. The second, horizontal articulation, provides for the identification of common or related elements across the different disciplines of the total educational program. The third dimension incorporates the manpower approach--whether or not employment is to be found in the occupation. The fourth and fifth encourage experimentation to gain perspective on the future.

A practical attempt to identify common skills across vocational areas was made by the Dade County Public Schools (1965). They identified common communication arts competencies and fundamental mathematics competencies across all vocational areas, and fundamental mathematics, chemistry, and physics competencies for clusters of occupations such as automotive mechanics, air conditioning, refrigeration, and heating mechanics and machine shop. On this basis, curricula for vocationally-related subjects can be built which serve a variety of occupational programs.

Other curriculum development approaches aimed at increasing transferability of vocational skills have also been recommended. Eddy (1963) recommended teaching trade theory while Stern (1964) recommended a "functions of industry approach" in the light of the ever-increasing complexity of the "materials age." Chaplin (1964) recommended a model for curriculum development based on role theory wherein the role that the teacher is to play for a particular subject matter is determined, providing a basis for the analysis of the subject matter into general concepts, understandings, attitudes and skills, necessary learning experiences, required student activities, and desired behavior changes. Finally, Macdonald (1966) advised that

vocational curricula be liberalized to provide a greater opportunity for creative exploration of tools and materials by students through an aesthetic, moral, or anthropological approach to the subject matter and required competencies.

The cluster approach appears to be a necessary and fruitful approach to curriculum development. As the number of occupational titles increases (and changes), it will be incumbent upon curriculum developers in vocational education to build curricula that provide for the possibilities of skill transfer. An analytic approach such as those described will be required. This is an area which requires more effort. Schemes such as those described must be tested on a developmental and pilot basis to evaluate their efficacy and produce refinements in their structure. While the literature abounds with descriptive statements of content-specific curricula that have been built and tried, only few attempts at the structural approach appear. The Bureau of Adult and Vocational Research listed curriculum experimentation as its second priority, and the most recent North Atlantic Regional Meeting of vocational educators listed it as a prime issue. Hopefully, these emphases will not result in more descriptive statements of specific curricula lacking conceptual structure and failing to provide evaluation in the form of experimental comparisons with existing alternatives. This area cries out for systematic exploration.

Curriculum Content

Lockette (1965) reviewed 26 studies dealing with curriculum content in industrial education. He concluded that industrial

education is lagging behind current technological developments (providing even greater evidence of the need for a structural approach). He advocated the use of subject matter experts, working in teams across disciplines, to remedy this situation. Moore (1961) surveyed the basic drawing needs of high school students as reported by engineers and draftsmen and discovered that aside from the content areas of blueprint reading and dimensioning, basic competencies in visualization, trigonometry, science, and getting along with others were the most important areas.

EDUCATIONAL PROGRAMS

This area of study produces some overlap which is resolved by making some arbitrary distinctions. Curriculum development, the preceding section, dealt with various approaches which could be used to teach a particular subject matter. Educational programs, on the other hand, is delimited to possible courses which may be combined to yield a program of study. It in turn would be comprised of a sequence of curricula. Thus, educational program development represents an administrative decision which can be subject to research. Secondly, problems and results of program evaluation will be dealt with in the section on Evaluation. Finally, problems associated with the funding of educational programs will be dealt with in the section on Administration and Supervision.

This section will be broken down into three parts. The first deals with the attainment of objectives of educational programs, the second with the characteristics of these programs, i.e., what they include, and the third with special programs for students with special needs.

The Attainment of Objectives

Wolfbein (1965) saw as a general objective for educational programs of the present and future that of making the next generation employable. He cited lack of education as the basis for unemployment and feels that educational attainment has an "hereditary" nature, i.e., children of parents with little education tend themselves to pursue educational goals only weakly while children of college graduate parents often pursue higher education themselves. Since the term "hereditary" implies that following in the footsteps of one's parents is somehow innate, this appears to be a misuse of the term. It would seem that if one's environment lacks conditions which are conducive to valuing education, then one is not likely to value it. Wolfbein contended that the attainment of a general educational objective can be furthered if counseling and guidance services are provided at the elementary school level.

A primary objective of educational programs in vocational education is that it be as readily available as possible. Of equal importance is that quality not be sacrificed for ubiquity. A controversy of sorts has emerged wherein the area vocational school and comprehensive high school are contrasted in terms of which should be the "home" of vocational education. Weaver (1964) took a survey among sophomore and junior high school students in Ohio and found that more than 50 per cent desired vocational training only while 25 per cent showed interest in both college prep and vocational courses. Only 13.5 per cent were totally disinterested in vocational courses. A study by McLure et al. (1960) of occupational trends and existing facilities in Illinois led to the conclusion that the state should

adopt the comprehensive high school approach to vocational education so that initial vocational study can be provided for 11th and 12th graders. This would necessitate the incorporation of smaller school districts.

Harris (1965) argued that the primary objective of vocational programs should be to blend the intellectual and the practical and contended that separation of vocational education and academic education will not only obscure this goal but will create second-class citizens of vocational students.

Haskew and Tumlin (1965) saw three possible objectives, not mutually exclusive, for vocational education: (1) to make the prime objective of vocational education coterminous with the intellectual training and personal-development objectives of the common school: the vocational approach here is only a vehicle to induce fundamental learning in some students through illustration and application; (2) to develop intellectual understanding of the occupational manifestations of American culture and to be required of all students; (3) to provide job training as an alternative to academic specialization.

Corazzini (1966) presented cost-benefit data in line with his contention that the objectives of vocational education can be more reasonably attained by the individual in high school rather than post-high school programs. Loss of income based on foregone earnings while the individual pursues a post-high school program (that might also be available in high school) is not regained for at least 15 years, if ever, since high school graduates often earn as much as graduates of post-high school programs.

In sum, research on the objectives of educational programs, if it can be justifiably called research, is preoccupied with the question of

"where vocational education should be taught," at the expense of studying "what should be taught" and "how it should be taught."

The Characteristics of Educational Programs

Stadt (1963) identified 12 criteria for programing in vocational education. Primary among these are criteria relating to the appropriateness of training for the occupation chosen: will jobs be available for graduates? Furthermore, programs should be structured to avoid duplication of existing courses and to attract future workers, and subsequently industry, to the area. Dauwalder's (1963) study of vocational education in Pittsburgh again emphasized analysis of the job market as a determinant for vocational offerings: build the program so that the students can learn something which will help them earn a living. Furthermore, programs should contribute to functional literacy, should fit industrial standards, should modify attitudes. The use of a core program, advisory committees, and an Industry-Education Council will facilitate program development. Pucel and Evans (1964) placed major emphasis on the usefulness criterion as well.

Seefield (1964) and Schaefer (1965) emphasized the reduction in the gap between liberal or academic education and vocational education. Today's vocational student needs language arts, math, and science competencies which are comparable to his college-bound counterpart. This point is supported in a study by Bowser (1960) who found that 91 per cent of the graduates of a terminal vocational trade program felt their related subjects, particularly mathematics and English, were helpful to them in employment.

Finally, Wood's (1964) observations on automatic industrial equipment lead to the conclusion that related work in electronics, hydraulics, and pneumatics may be a necessity in all vocational programs.

Special Programs

Burchill (1962) reported on a Phi Delta Kappa Commission study of nine experimental programs for alienated youth to extract the elements essential to successful operation. The principles derived from this investigation display close correspondence to the traditional requirements for reimbursable cooperative work-study programs. (As a popular TV commercial says: "We must be doing something right.")

A National Education Association (1963b) study on programs for potential drop-outs and delinquents recommended that secondary schools provide vocational programs for some of these students, but that ways be discovered for increasing the meaningfulness of academic education for others. Havighurst (1963) recommends work-study programs beginning for students at age 13 as a preventative measure for juvenile delinquency. Traditionally, such programs begin in the 11th grade, a level which delinquent-prone youth rarely attain. Langerman (1963) studied vocationally trained boys released from the Iowa Training School for Boys and discovered that 94 per cent were employed as compared to 54 per cent among non-vocationally trained boys. The former used their vocational certificates to gain employment, in most cases in the field for which they were trained. Unfortunately, only 38 per cent of the trainees were on the same job one year later.

Loveless (1962) found that only one-quarter of the hard-core unemployed of St. Francis County, Missouri, had completed their high school education and only one-third of this group were willing to undertake retraining in a new job even if it necessitated moving. The remainder were planning to wait for better days.

Dunton (1964) undertook a follow-up study of T & I program graduates and found that those students whose 10th grade prevocational scores were below a certain level were not able to succeed in the trade for which they had been trained. He recommended that a special program for these youth be developed instead of admitting them to the regular T & I program. This recommendation was implemented. Not only was the regular program improved by the removal of the less able, but this handicapped group was able to receive a vocational education, featuring the cooperative work-study approach in low-skilled occupations from which they could profit.

On the other side of the coin, Cory (1964) recommended a vocational program for academically talented students. Industrial educators were surveyed and were in accord. The experts felt that such a program required a minimum IQ of 110 for admission, should begin in the ninth grade, and should include algebra and mechanical drawing as well as such areas as industrial organization and management, strength and testing of materials, and power and motion mechanics. Such teaching techniques as experimentation and projects would be employed.

The U.S. Department of Labor (1966d) reported that of the 152,000 students enrolled in the institutional MDTA programs, 74 per cent had completed training and were now gainfully employed. About one-third of the trainees are being trained for job entry at the skilled level

and better than three-quarters of these obtain employment upon program completion. Similar successes are reported for students in the on-the-job training program, many of whom are studying automotive occupations. Walsh (1963) also presented data attesting to the success of MDTA programs in reaching their target group--the undereducated, long-term unemployed. He reported that seven out of 10 graduates obtain immediate job placement, many of them as skilled craftsmen.

The State of New Jersey (1966) reported that 5,204 apprentices were employed last year, 86 per cent of whom received related instruction in the public schools. Of the employed apprentices, 56 per cent were in the building trades and 22 per cent in the machine shop trades.

INSTRUCTIONAL MATERIALS AND DEVICES

There is no shortage in the literature of descriptive statements of specific materials and devices which have been developed and tried out by specific teachers in specific classes. However, these descriptive approaches do not constitute research. What is called for is an experimental test of the efficacy of these approaches when compared to alternative approaches. Consequently, this area shows up as a relatively weak one in terms of research even though its importance and relevance to vocational education is considerable.

Learning Programs - Teaching Machines

Shemick (1964) compared the efficacy of teaching metal spinning by means of a learning program as compared to the traditional method of teaching the subject. Students being taught by the traditional

method producer higher quality work, took less time to complete the task but required more teacher assistance. The learning program appeared to fail because it did not provide an over-all orientation to the task and did not allow enough student activity required for learning a psychomotor skill.

Schill (1965) compared learning by means of a programed instructional device to the more traditional lecture-laboratory technique. Neither approach was found to be superior to the other. Moreover, students who used the programed learning device developed strong negative attitudes toward programed learning as a total mechanization approach to teaching.

Folley et al. (1964) taught military trainees to assemble and disassemble an M1 carbine using the lecture-demonstration approach, a printed linear program, and an audio-visual program. Results showed that none of three modes of training was clearly superior to the others.

Suess (1966) reviewed 22 studies illustrative of the "SVAFU" regarding teaching methods in industrial education. The studies cited showed that programed instruction yielded equal immediate performance and retention to that resulting from the lecture-demonstration approach. The programed learning approach appeared to require more student time and less teacher time than the alternative lecture-demonstration. Comparisons of the visual-aids mode of teaching to the demonstration approach showed no differences in the effectiveness of the techniques. However, the comparison of demonstrations to lectures showed that the former were more effective and efficient. Suess concluded that research to find a superior method is almost

certainly doomed to failure since the efficacy of different approaches is jointly a function of the approach and the type of students with whom it is to be used.

It is recommended that studies be undertaken to explore the effects of "what goes into the teaching machine" and to determine the effects of different instructional devices with groups of learners having different characteristics. Programed learning may be a reasonable way to teach students of low IQ the fundamental concepts of a subject such as shop mathematics. The students taught and the subject matter taught may be critical.

Instructional Television

Stout (1963) explored the efficacy of using instructional television to teach an electronics technology course. He found that the TV approach was as effective in teaching students as was the lecture-demonstration approach with the teacher present in the classroom. He also found that instructional TV was feasible and practical, both mechanically and economically, provided that no less than 50 students are taught by TV, that they are given an orientation to it before beginning the course, and are not in the room where the instructor is being televised.

Manchak (1962) strongly recommended the use of instructional television in industrial education since his experience indicated it is as effective as the "live teacher" approach while being applicable to a wide variety of situations. The use of magnification and close-up techniques make TV especially valuable in the vocational classroom.

Assignment Sheets

Cornwall (1961) found that problem-centered assignment sheets resulted in superior performance test scores as compared to traditional assignment sheets. Brantner and Schaefer (1962) compared the use of assignment sheets that were dittoed, mimeographed, and photo off-set. Accuracy, completeness, and physical organization of answers did not differ from one format to the others.

Miscellaneous

Foley (1964) developed an experimental course to teach electronics fundamentals to military trainees. The experimental course was organized around specially designed trainers that incorporated the desired circuits and task requirements, all pre-wired, and arranged in order of difficulty. The experimental course also involved experience before theory and learning by discovery. When compared to the traditional method of teaching the course, the experimental approach was found to be considerably more successful than the traditional for teaching persons of average aptitude; the two did not differ in success with students of high aptitude.

Folley (1961) outlined a procedure for systematically designing performance aids in four steps: (1) identifying task elements for which aids are needed; (2) determining the functional characteristics of aids for these task elements; (3) specifying the physical design characteristics of the aids; (4) evaluating, modifying, and updating the aids.

LEARNING PROCESSES AND TEACHING METHODS

Teaching Methods

Jonas (1962) identified the following seven requirements for effective communication in the instructional process: (1) course material must be useful; (2) the student must feel he needs the information, (3) be motivated, (4) and make an attempt to learn; (5) the teacher must give the student an opportunity to learn, (6) check on his progress, and (7) correct errors in a proper manner.

Pankowski (1965) generated a guide for the development of motor skills which requires that the teacher teach to minimize retroactive inhibition, manually direct students to get the feel of tasks, tell the students what to do rather than what not to do, apply distributive practice, teach one good form of a motor skill, create an atmosphere favorable to learning under conditions similar to those where the skill will be used, encourage the student to use rhythm while learning and to work for speed, and teach in the largest units that can be comprehended. This is strongly reinforced by Rudiger (1965) who emphasized the need to teach vocational students motor skills since automation has not as yet reduced the skilled worker from a "doer" to an "observer."

While Miller (1965) did not advocate the exclusive use of a single teaching method, he endorsed the general use of the problem-solving approach wherein students are encouraged and taught to use the scientific method of problem analysis and attack. While combinations of methods are often the most effective, the logical problem-solving approach should be included. Rowlett (1964a) reviewed literature

bearing on the use of the problem-solving approach to teaching. The problem-solving approach has been found to improve creative thought processes and improve the problem-solving ability of students. However, such improvement is not solely a function of the technique but a function of the teacher using the technique as well. Rowlett also reports on the effective use of inductive teaching approaches.

Siegel et al. (1960) compared the effectiveness of specific training as compared to general training among naval aviation trainees. In tasks dependent upon mechanical ability and perceptual motor skills, neither approach was superior. However, in tasks dependent upon verbal factors and abstract reasoning, the groups trained by the general approach were superior.

Direct-Detailed vs. Direct-Discovery Methods of Instruction

Rowlett (1964b) attributed the direct-detailed technique to the Thorndike school of psychology which treats learning as the association of continguously occurring elements. In the direct-detailed approach, instructions relevant to principles and generalizations are presented in a detailed manner with illustrations showing their application to problem-solving. Rowlett identified direct-discovery techniques with the Gestalt school of psychology which sees learning as a function of the inherent organization of material. The direct-discovery method leaves the student to his own devices but structures the material so that meanings and applications may be discovered. Rowlett found that in initial learning of orthographic projection principles and skills, both methods were equally effective. However, differences favoring the direct-discovery method were found in

amount of transfer over time. Prior to this, Moss (1960) showed no differences between the two techniques for teaching letterpress imposition.

Suess (1965) reviewed studies comparing the two techniques which led him to challenge Rowlett's finding. Evidence showed, claimed Suess, that of critical importance was the opportunity for manipulation of objects during the learning process. Tasks employing manipulation appeared to be more effectively taught using the direct-discovery approach while tasks dealing with specific factual material were more effectively taught by direct-detail. In a replication of Rowlett's study, Suess obtained findings contrary to those of Rowlett.

Learning Processes

Drew (1964) discovered a significant positive relation between reading test scores and subsequent grades in related instruction for machinist apprentices. This relationship did not hold for apprentices having two years of on-the-job training prior to, and during, related instruction. In the absence of work experiences, reading skill appears to be an important element of learning capacity for related apprentice instruction.

Hull (1965) found that a higher IQ group outperformed a lower IQ group on an intellectual task regardless of the amount of practice each had had, while on a manipulative task, practiced groups outperformed unpracticed groups regardless of IQ level. This indicates that performance is jointly a function of type of skills demanded by the task and ability.

Wills (1965) compared teaching techniques emphasizing speed of performance with those not having this emphasis in a class on

beginning metalwork. Emphasis in speed of performance resulted in a greater quantity of work done at the expense of more student errors and less economy of materials when compared with the no-emphasis condition. Resultant quality of work and student attitudes did not differ across conditions.

Waetjen (1964) contended that when the learning situation entirely matches the expectations of the student (a condition called consonance), and when the learning situation is widely discrepant from the student's expectations (i.e., dissonance), learning is not facilitated. For learning to be facilitated, the learning situation must be only slightly discrepant from the student's expectations.

Attitude Change in the Classroom

Householder and Suess (1965) found that students' opinions of the importance of wood-working materials could be altered by group discussion (but not necessarily in the direction of greater "accuracy"). They also demonstrated that changes in students' attitudes in the classroom are in part based on teacher influence even though the teacher is often unconscious of his influence.

Since students' attitudes have been shown to be influenced by teachers, it is not unreasonable to examine the attitudes of vocational teachers. Bowman (1966) found that the attitudes of vocational teachers are significantly more authoritarian than the attitudes of academic teachers, but that both groups are equally intelligent. She reasoned that if authoritarian attitudes facilitate the teaching of task-oriented material (cf. Lewin et al., 1939) then such attitudes were appropriate for vocational teachers.

STUDENT PERSONNEL SERVICES

This section has been subdivided into five subsections as follows: (1) selection, (2) guidance, (3) vocational development, (4) placement, and (5) drop-out identification and prevention. The first category bears obvious relation to administration and supervision since selection represents an administrative decision. The fourth section, on placement, is also developed extensively in the section on Evaluation since the follow-up study is a valuable evaluative tool. Finally, the fifth section is a rather special case of educational programs.

Selection

The importance of using selection tests and criteria as a basis for selecting students who are most likely to succeed in vocational programs has been strongly emphasized (Culver, 1961; Burt, 1963; Crawford, 1964). Keller (1962), in an extensive study of vocational education, found that only 41 per cent of the schools he visited used tests as part of their selection devices. However, vocational high schools were found to reject as many as 75 per cent of the applicants while comprehensive high schools were required to admit all who applied. Among the selection test users, most gave tests of mechanical ability, interest, and general intelligence. Often, reliance was placed on the latter even though it ran counter to the experience of the principal. Whitten (1961) found no significant relationship between ninth grade attendance records of students and probability of completion of vocational programs at the high school level.

Johnson (1959) found that the three most commonly used practices for locating and recruiting apprentice trainees were regular contacts with school officials, posting notices in the plant, and using present employees to help locate prospects. Hagemeyer (1961) surveyed Michigan employers who identified the following as important selection criteria for apprentices: possession of manipulative skills, prior work experience, previous employer recommendations, and graduation from high school, including completion of certain mathematics courses. School recommendations were not considered particularly important. Drew (1962) found that reading ability and mechanical adaptability showed promise of predicting both in-school achievement and job performance of machinist apprentices.

Griess (1966) found that scores on the language subscale of the elementary level California Test of Mental Maturity were highly valuable in predicting scores on the general intelligence scale (G) of the General Aptitude Test Battery (GATB) following 12 weeks of pre-occupational basic education training. Had the CTMM been used as a selection device for this program, success in terms of elevation in intelligence scores following training would have been virtually guaranteed.

Guidance

Sharp and Nunnery (1963) described the ways in which teachers can help students make vocational choices. Guidance is seen as having three aspects: imparting occupational information, appraisal, and decision-making. Teachers can aid students in all three areas.

Schaefer and Prichard (1963) contended that "some schools short change students in vocational education" by providing an extremely

limited number of vocational offerings. Where the high school offers good trade and industrial programs, guidance systems in the junior high schools that feed the high school are good. The extent of guidance programs seems to be a direct function of the variety of offerings at that level of education.

Frye (1962) found that vocational choices in a Columbia, Missouri, high school were far out of line with actual opportunities in the area, indicating that meaningful occupational information and proper vocational guidance were not being made available to students. This factor is conducive to dropping-out.

Flanagan (1963) advocated the use of data on individual aptitudes as a basis for vocational guidance and recommended the development of a "vocational curriculum suitability index" as a means of helping students choose between academic and vocational programs. McCall (1965) reviewed 32 articles dealing with the measurement of vocational interests and their use as guidance devices. Using interest test scores to predict learning or motivation has often been fruitless, not because of the construction of the tests, but because of our failure to understand what they measure. Recent work on the Strong Vocational Interest Blank and Minnesota Test of Vocational Interests seems promising.

An excellent example of the use of tests as a basis for guidance is found in the work of Crawford (1966) at the Los Angeles Trade and Technical College. Guidance into different programs is based on the student's scores on a battery of tests which have been shown to have predictive value for a particular occupational area. For example, tests of perceptual speed, mechanical knowledge, and spatial orientation are predictive of success in auto mechanics programs while tests

of manual dexterity often predict machine shop success. Color vision tests are helpful in predicting success in offset press operation while form board tests have predictive value for automotive body and fender repair programs.

Foote (1960) found that computational skill, mechanical knowledge, and spatial relations were related to scores on a final performance test in auto mechanics, while Kuder interests, reading ability, and mechanical ability were not.

Brown (1960) found that trade students who had made an occupational choice to work in the occupation for which they had been trained were more likely to have taken industrial arts in junior high school, to have spent time with their guidance counselor, to be in machinists programs, and to have achieved above the 25th percentile in the curriculum than students who had not chosen to enter the occupation they had been trained for or had made no choice. Measures of verbal intelligence and vocational interests had little predictive value for course completion or occupation entered upon graduation. Yung (1965) similarly found that students making auto mechanics their career choice prior to graduation, and subsequently entering that field, had greater occupational stability than students not behaving in this fashion, even though both groups had graduated from programs in auto mechanics.

Ruch and Ruch (1960) found that success in draftsman training could be predicted by scores on the Employment Aptitude Survey. Moss (1965) summed up a review of 14 studies in this area with the following statement:

> On the basis of the studies reviewed, completion and intent to pursue the occupation are strongly related to a minimum level of ability to achieve, degree of

> vocational maturity, and motivational factors: school achievement has been correlated with objective measures as high as .6. The problem of increasing the effectiveness of prediction is multiplied by the diversity among curricula with the same occupational objective, and by rapid changes in course content within each institution; it is further complicated by the necessity to cross-validate results - a procedure so far neglected by most of our researchers - and to employ larger samples. (p. 9)

The guidance area is one where considerable research is needed if we are to optimize the value of vocational education for the individual student. Much dropping-out can be avoided and much can be gained by appropriate assignment of students to programs. This can only be accomplished through further development and refinement of predictive devices and measures.

Vocational Development

Nunnery and Sharp (1963) reported on the theorizing of Ginzberg, Super, Tiedeman, and Caplow concerning the nature of vocational development. Ginzberg et al. (1951) contended that vocational choices are initially based on wishes and fantasy, followed by a period during which they are governed by interests and values, and lastly by opportunities. Super et al. (1963) emphasized development and implementation of the self-concept and the tendency of choices to change as the situation changes, while Tiedeman et al. (1963) identified a period of anticipation including exploration, crystallization, choice, and specification followed by implementation. Numerous theorists stress the "environmental reality" factors such as socio-economic status of parents, geographical location and opportunities. Caplow (1954) posited that vocational choice is made in terms of educational requirements rather than the actual demands of the vocation.

Walz (1963) reviewed 52 articles dealing with vocational development and concluded that materials and practices were lagging far behind theoretical developments. The mounting knowledge of vocational behavior can only be capitalized on if it is operationalized by the guidance counselors. Ferguson (1962) reviewed 42 studies in this area, as well, and also made mention of the rapid development of theory, much of which has been outlined and integrated by Borow (1960, 1961), especially that dealing with needs, values, and models as organizers of vocational development and choice. Again, there is some question as to whether these developments will pervade counseling at the secondary school level.

Placement

Most of the studies dealing with placement are primarily relevant to the evaluation of vocational programs and only secondarily to student personnel services; they will be treated in the section on Evaluation.

Zanzalari (1960a) found that of the 1958 graduates of vocational and technical high schools in New Jersey, 80 per cent were placed in related occupations. He also reported (1960b) that the typical shop teacher is willing to cooperate with the placement counselor in order that the objectives of a vocational education be obtained by the student. Eninger (1965) found that placement of vocational school graduates was slightly quicker and more likely to be in the trade for which they were trained than graduates of comprehensive high school vocational programs.

Sheppard and Belitsky (1965) found that unemployed workers who use the public employment service for job placement tended to be low in achievement values and high in interview anxiety, while those who got new jobs through direct application to companies were high in motivation and low in interview anxiety.

Drop-Out Identification and Prevention

Walsh (1965) found that the most practical and effective index for identifying potential drop-outs was a combination of grade point average in the lower quarter of the class and lack of participation in extracurricular activities. However, potential drop-outs enrolled in practical arts and vocational courses were more likely to remain in school than those not so enrolled. Thus, vocational programs contribute to the holding power of the comprehensive high school. Sloane (1964) studied drop-outs in Dade County, Florida, and found that they had been left back more times, failed more subjects, scored lower on IQ and school ability tests, engaged in markedly fewer extracurricular activities, had parents with less education, and were less likely to be employed in skilled occupations than high school graduates. Gallington (1966a) found that the best predictors of dropping-out were school achievement, reading and math placement, and father's occupation. Furthermore, graduates had noticeably better attitudes than drop-outs and were better informed about occupations.

Gallington (1966b) found that potential drop-outs who were exposed to vocational counseling and occupational information group study classes for a year showed less dropping out and fewer transfers than matched controls not exposed to the program. Luy (1964) studied

unemployed youth in an MDTA project in St. Louis and found that 87 per cent were high school drop-outs and only 12 per cent had previous vocational training. However, 67 per cent aspired to jobs of a skilled nature and 80 per cent were willing to move from the area to gain employment.

Considerably more research is called for in this important area with its many unfortunate social ramifications.

FACILITIES AND EQUIPMENT

Based on a survey of Michigan high school principals, Wenrich (1963) concluded that area vocational school facilities, to which students could be transported on a part-time basis, would be an effective means of occupational preparation in the state. Related course work would be provided in comprehensive high school facilities.

Other researchers have concerned themselves with the feasibility of area vocational schools. Cambell (1965) proposed the following seven criteria to be used as guidelines to determine the location and development of these facilities: (1) population, (2) employment opportunities, (3) relation to county and multi-county organizational patterns, (4) relation to needed and present financial structure, (5) relation to needed and present legal provisions, (6) interests and attitudes of local administration and public, and (7) available facilities. Van Tries (1964) also found a need for more and improved vocational facilities. He suggested that new area vocational schools continue to build on their original structure wholly through the efforts of the local school district and that a priority basis be established for the allocation of federal funds.

An answer to the urgent problem of updating inservice vocational teachers is supplied by Larson (1965, 1966) in his outline of T.R.C. (Technology-Resource Center for Vocational Education), designed to supplement, not supplant, existing teacher education programs by emphasizing inservice updating education in a facility specifically designed for this purpose. T.R.C. with maximum programing flexibility is designed to insure the use of the latest materials available to provide an effective link between education, industry, and the community.

In April of 1963, School Shop devoted an entire issue of their journal to shop environment. MacConnell (1963) stated that in order for vocational education to be an integrated part of the total school program, shops and general education classrooms must be integrated in the school building. In planning the shop, Hooker (1963) felt that the student must be able to participate in his environment if it is to be effective. Fitts (1963) concluded that shop safety can be expedited through architectural design, shop layout, and machine construction. Rutgers (1963) pointed out the importance of the optimum thermal climate in the shop and Boyd (1963) reminded architects that the principle reason for lighting is so that the student can see his work, not for aesthetic value. The use of color in the shop was discussed by Lytle (1963) who concluded that it is an important element providing identity and visibility and minimizing monotony. Gilliand (1963) pointed out that unwarranted sound or noise "eats away" at human energy and efficiency and so must be controlled. Hoffman (1963) felt that the key to shop environment is the attitudes of teachers and students concerning the worthiness of the job that they are doing.

Because of the great need for skilled workers in our society today, Iverson (1963) concluded that shop environment must be geared to the maximum development of abilities at all ability levels. Micheels (1963), in a review of the previous articles, summarized by stating that the shop environment must be planned for more than "thing making."

Systematic investigation must be undertaken to study the variables involved in the construction of vocational-technical facilities and equipment and their effect on the learning process. In order to insure maximal effective use of these facilities, technical-vocational educators must be able to provide architects and builders with educational specifications to be applied to future plans. Concepts such as T.R.C. must be developed if efficient utilization and integration of facilities and equipment at our disposal, both present and future, are to be employed in training youth. Only persistent research can produce such concepts.

TEACHER EDUCATION

A review of 94 studies dealing with Trade and Industrial teacher education was prepared by O'Brian and Schaefer (1966). Many of the studies they reviewed are reviewed here.

As a way of introduction, Swanson and Kramer (1965) stated the following:

> Just as there is a need for a more comprehensive program for the preparation of individuals to enter the labor force, so it follows that the program of preparation for the vocational teacher must be more rigorous and often quite different from those now provided. Collegiate preparation of vocational teachers . . . is becoming more and more accepted as logical and necessary. This is not to suggest that the vocational education teacher's need for successful work experience in the occupation in which he will be teaching is considered to be any less important. (p. 169)

Recruitment and Selection of Teachers

That teacher recruitment is clearly a problem area was highlighted by Venn (1964) when he said:

> One of the greatest handicaps to the improvement and expansion of vocational and technical education is the desperate shortage of qualified teachers and administrators. (p. 151)

Schaefer (1963) contended that yesterday's solutions for recruiting T & I teachers were based on yesterday's technology. Furthermore, Giachino (1961) contended that selection procedures must be updated as well and has developed some techniques along this line. Considering selection devices, Impellitteri (1965) analyzed individual scores on trade competency exams and found that the number of years of industrial experience the individual had was not predictive of his performance on the test.

Data collected by Fagan (1960) indicated that ways should be found to identify future vocational teachers while they are still students in our schools, provide these people with challenging programs, and place them in situations where their potential as teachers can be evaluated.

Vezzani (1965) saw the vocational teacher as the "forgotten individual" in our recent vocational legislation, perhaps because administrators are torn between the importance of trade experience of the college degree. He identified nine steps to be taken in solving this problem, the primary ones being the establishment of selection and screening procedures to identify qualified individuals in both academic and work settings.

Parks (1965) studied those factors that cause tradesmen to leave the shop and enter the teaching profession. Two factors identified

were the quest for self-realization and the desire to be of service. Job security did not appear to be an influencing factor. (It is not inconceivable that the respondents in this study were influenced by social desirability considerations in making their responses.) Schill (1964a) found that those men who pursue education while at work in their trade were more likely than their cohorts to continue this course after entry into teaching. This could conceivably serve as a selection device.

Finally, the U.S. Department of Health, Education, and Welfare (1966) reported that teachers for MDTA programs had to be recruited through employment services, universities, newspaper advertisements, and personal contacts with industry and organized labor after those available through the ranks of vocational education teachers had been depleted.

Teacher Competencies

Feirer (1961) contended that vocational teachers must not only be adept in the content of their field but must also have a thorough grasp of methodology.

This requirement for theory and practice, intellectual exposure and practical experience, knowing "how to teach" as well as "what to teach," having breadth and depth in industrial work experience and the same in technical courses as part of industrial teacher preparation has been emphasized and re-emphasized (Smith, 1963; Schill, 1964b; Silvius and Ford, 1965; Walsh and Selden, 1965). Wynard (1960) found that employers of T & I teachers considered at least three years of recent comprehensive journeyman experience and one year of probationary

teaching highly desirable, more so than prior academic background. Moeller's (1961) respondents, representatives of labor and industry, felt journeyman experience and academic preparation were both absolutely essential for industrial teacher education. Schaefer's (1963b) respondents, local vocational directors and leaders in vocational teacher education, were in accord that a superior teacher differs from a usual teacher in terms of his knowledge of the subject matter and skills to be taught. The "good" and the "ordinary" teacher were not judged to differ on their knowledge of the history of education.

Robertson (1965) pointed out that the industrial instructor must be able to set specific, attainable goals as objectives to be achieved by the learner in order to plan what the student will be doing. Walsh (1960), in what must be considered the major study of T & I teacher education thus far undertaken, had communities of experts rate teacher competencies in terms of their relative importance. Teachers rated competencies expressed as ability to do something (e.g., develop safety attitudes, stimulate student interest, develop an appreciation of good workmanship) as more important than competencies expressed in terms of knowledge or understanding. However, teacher educators rated knowledge of the objectives of vocational education and knowing how to analyze a trade as more important than motivating, stimulating, and maintaining safety. They also felt that knowing the principles of learning was important.

Teacher Education Programs

Allen (1964) reported on two core programs for trade and technical teacher education developed at UCLA. These programs utilize

team teaching and varying class sizes and are an attempt to solve some of the problems associated with sequencing and coordination. Ramp (1962) advocated the cooperative trade and teacher training approach beginning with young people who have made a career decision to teach. The Illinois program requires a two-year technical institute experience followed by two years of teacher training coursework at the university. The student must also work for two years, full time, in his trade area.

Tuckman and O'Brian (in preparation) described a master's program for preparing vocational teachers to teach culturally disadvantaged youth. Assuming such teachers are already well-versed in their trade areas, the program places emphasis on broad training in sociology, social psychology, learning concepts, and teaching methods--all geared to disadvantaged youth. Three direct field experiences are included in the program.

The correspondence between specific teacher training courses and industrial practices was found to be somewhat wanting by G. Brown (1960).

Wenrich (1962a) discovered that cessation of special state and federal funds for teacher education in Michigan would presumably not affect pre-service teacher training, assisting teachers in planning programs leading to certification and supervised practice teaching. What would be affected by this hypothetical situation would be activities of the professional staff not directly related to teacher education (e.g., developing instructional materials, working with special youth groups).

The Report of the Panel of Consultants on Vocational Education (U.S. Department of Health, Education, and Welfare, 1963) informed us that there were more than 11,000 teaching positions in day trade schools, more than 16,000 in evening programs, and more than 7,000 in part-time programs. The report outlined prevailing teacher education practices across the country, noting its variability and weaknesses, especially in programs for trade extension teachers. Since vocational teachers must learn their occupational skills in industry and their teaching skills in universities (or comparable institutions), greater utilization of cooperative type training programs are recommended. The U.S. Department of Health, Education, and Welfare (1965b) reported that during the 1963-64 academic year, 2,000 persons earned bachelor's degrees for T & I training, an increase of more than 300 from the previous year. Thirty-two master's and 12 doctor's degrees also were awarded in this area.

Inservice Programs

Teufner (1961) and Micheels (1965) emphasized the importance of inservice teacher education programs as an updating technique and outlined some procedures for its effective implementation. W. Brown (1963) described inservice education in Phoenix which includes pre-teaching orientation, instructional improvement "half-days," college extension courses, and summer workshops, all of which have led to better quality teaching. The Connecticut Department of Education (1963) determined that half of their vocational teaching staff were engaged in inservice educational activities including formal education and trade courses, workshops, and employment in trade-related

occupations. Brantner (1964) found that trade and technical teachers were involved in both professional inservice education and subject-matter inservice education. Very appropriately, those pursuing the former were teachers with relatively little teaching experience while those pursuing the latter had had only limited work experience.

Littrell (1965) studied trade and industrial student teachers and found them to be "exploited" by cooperating teachers. However, the student teachers themselves had expected this and were not at all unhappy about having the opportunity to prepare and teach lessons (which also provided the cooperating teacher with a rest). Such "substitute" teaching occurred primarily in areas in which the co-operating teacher was weak.

Evaluation of Teacher Education Programs

Swanson (1964) examined master's level programs in industrial education and found that their greatest strength was in the area of professional education, with research and technical education intermediate and general education weakest. Ginther (1964) reported that the portion of time devoted to the development of specialized technical competencies in the master's and doctoral programs he studied was considerably less than what his respondents believed should be devoted to this purpose. Ryan (1963) examined T & I teacher education programs in North Carolina and reported that about three-quarters of the beginning teachers felt that they had received help from their teacher training program in dealing with initial teaching problems. Brantner (1962) asked T & I teachers in Pennsylvania to express their attitude on the adequacy of the instruction received in eight

required courses. Judgments of the teachers' application of this instruction to their teaching activities were also elicited. A majority of the teachers rated the instruction they had received as adequate. Moreover, a significant relationship between adequacy of instruction and competency of application was evidenced; i.e., the better one's preparation, the better one applies what has been learned.

Courtney (1965) had teacher education graduates of Stout State University identify the factors on which they were most well-prepared and those of greatest need or requirement. Five of the 11 most needed or required skills were ones on which they felt they had been well prepared. Interestingly enough, these all dealt with methods and techniques of teaching, test construction, lesson planning, and curriculum building. Those for which they were ill-prepared included maintaining student interest, motivating students, maintaining discipline, dealing with individual differences, and evaluation.

Walsh (1960) had 121 state supervisors of T & I, 91 local supervisors of T & I, and 103 teacher educators rate the competence of recently-trained T & I teachers. Respondents were generally satisfied with the teachers' trade competency, ability to demonstrate the skills of the trade, and ability to maintain discipline. They were most dissatisfied with the teachers' experience in developing instructional materials and ability to prepare tests and evaluate students. On the whole, about one-half of the respondents were satisfied with the teacher education programs and one-half dissatisfied. Teachers themselves rated direct experiences such as supervised teaching, trade experience, and planned observation of teaching as most valuable in their teacher education programs. Contrary to the ratings of their

superiors, teachers felt that coursework in job analysis, teaching methods, developing instructional materials, and test and measurements made strongest contributions to their teaching success.

Obviously, teachers strengths are a function of the areas most emphasized and best taught in the specific institutions from which they obtained training. Some institutions emphasize technical competency while others emphasize teaching methods. Consequently, research findings are contradictory and confusing. Judgments of state directors and teacher educators do not necessarily conform to those of the teachers themselves. The answer may lie in a job analysis of teaching tasks based on direct observation of many teachers in many settings to determine how often different skills and techniques are called for. This, then, could form the basis for teacher education programs.

In the final analysis, the best test of teacher training is the quality of offerings provided by those teachers. In anticipation of findings to be discussed in detail in the section on Evaluation, teachers are doing a high quality job in T & I education. The problem is in recruitment and number of teacher education programs: there simply are not enough teachers. Moreover, teachers are going to have to be provided with more skills necessary to teach the culturally disadvantaged, often nonwhite, ghetto youth. This is the area where research and development must blossom.

ADMINISTRATION AND SUPERVISION

Moss (1965) reviewed numerous articles dealing with research in administration and supervision for industrial education and concluded with critical comments concerning the limited use of sound experimental

methodology and the failure of researchers to generate findings of specific use to administrators. Since the administrator is the decision-maker in vocational education, this is clearly an area where research can and should contribute but heretofore has made only slight contributions.

Preparation of Leaders

Olivo (1965) contended that program growth in vocational education is being impeded by a lack of well-prepared, qualified administrators. He suggested that graduate programs for administrators include knowledge and experiences related to administration and supervision; occupational analysis and curriculum development; concepts of vocational education; laws, regulations, and policies; planning facilities; and financial matters. This on-campus training would then be followed by field direction and an on-the-job internship in administration.

London (1965) suggested that leaders have the following: work experience, four years of college, two or more years of teaching experience, and strongly favorable attitudes toward the value of vocational education.

O'Brian (1966) brought together leaders in a variety of disciplines and asked them what the "new breed" of leader in vocational education should know. The following emerged as broad categories of requisite knowledge: counseling and guidance, labor economics, social psychology and group dynamics, the sociology of work, industry, and minority groups, labor-management relations, industrial organization, training, facilities, and, of course, the concepts of vocational

education. Subsequently, an advanced degree program has been instituted at Rutgers incorporating these recommendations.

Schaefer (1962a) developed instruments to identify effective and ineffective local directors and to analyze the competencies contributing to the director's relative success. Results obtained were tentative.

Administration of Local Programs

The primary area of investigation relevant to the administration of local programs is that of authority--particularly identifying the authority that the local director has and who he is responsible to. A study undertaken by the State of Pennsylvania Research Advisory Committee (1960) identified major problems recognized by local directors. While improving shop safety, recruitment, selection, and training of instructors and enlisting the interest of prospective students were mentioned, primary importance was assigned to the issue of opinion and influence of local school administrators on the development of vocational programs.

McDowell (1965) had industrial education experts rate statements related to the administration of local programs. Experts indicated that the administrator should be responsible to someone higher and delegate authority to his assistants while remaining totally responsible for all activities in his school. In addition, he should be experienced in administration and vocational education, not be rigid, and maintain close contact with the people.

Mason (1963) studied the distribution of authority within vocational programs in Michigan high school systems and its influence on the quality of the program. Superintendents associated with

highly-rated programs retained slightly less authority than superintendents in low-rated programs. It is possible, however, that the official distribution of authority may not be representative of the actual distribution. Mathews (1963) studied vocational directors in Michigan and found them to be confused over their position in the line of authority and the educational areas for which they were responsible. Campion (1965) recommended that local directors study the power structure in the community so that they can communicate ideas to individuals whose approval is necessary for action. Only in this manner can they influence policy.

McComas and Willey (1966) suggested that state directors of vocational education carry out active recruitment campaigns to bring administrators and potential administrators, capable of planning programs, into the fold in order to fill the demand.

O'Brien (1963) advocated that T & I programs be administered directly by the state for the following reasons: (1) policies and procedures can be determined at a central source, (2) no geographical limitations, (3) particular programs can be decided upon and operation begun quickly without waiting for local boards and superintendents to make up their mind, (4) the neglect of comprehensive high school T & I programs by academic-minded administrators can be avoided, (5) personnel can be transferred more easily to points where needed, (6) large areas can be covered efficiently by concentration of facilities without being dependent upon local boards to provide these facilities.

Supervision

Dull (1960), with the help of a jury of experts, developed a list of evaluative criteria for supervisory programs and used it to evaluate 18 Ohio school systems. His results corresponded closely to prior ratings of the systems by state education officials. These criteria are recommended for use in self-evaluation of systems and supervisory training courses. Bentley and Rempel (1962) developed a morale instrument on which they obtained high positive correlations with expressed teacher satisfaction, feelings about the future of the teaching field, amount of salary and possession of tenure. Furthermore, students of high morale teachers had better attitudes toward school and higher IQ's than students of low morale teachers. Of course, one cannot tell whether higher teacher morale produced better student attitudes or better student attitudes produced higher teacher morale.

Additional studies on the supervision of instruction appear in the section in Teacher Education.

School Relations: Attitudes

Wenrich and Crowley (1964) found that school professionals who held positive attitudes toward vocational education in the secondary schools did so because they felt that some form of vocational education served to develop well-rounded youth. In considering program against program, administrators felt the vocational education program was less respectable than the college prep program, believing election of the former to be based on social class factors rather than aspirations or special interests. It appeared that school professionals more familiar with vocational education were more critical of it.

Schaefer (1962b) obtained data from school board members and administrators in school districts with and without T & I programs and found those with programs to be more favorably disposed toward T & I education than those without programs. Favorably disposed board members had, in many instances, taken vocational subjects themselves, were rarely college graduates, and were employed in technical occupations. Underlying unfavorable attitudes toward T & I programs among administrators were the following: (1) it is taken as a frill, (2) it's a dumping ground for lazy students and slow learners, (3) facilities are too costly while alternative programs are worthwhile, (4) T & I programs fail to serve manpower needs. Similar findings were obtained by Prichard (1962).

Agan (1960) found that administrators of "successful" vocational programs in Kansas were not inclined to recommend that changes be made in these programs. Bugher (1960) found that many superintendents of school districts providing vocational programs in Indiana disagreed with the current nature, clientele, and importance of these programs. They would, however, accept a list of purposes and principles for vocational programs generated by a national jury of interdisciplinary experts.

Program Funding

The U.S. Department of Health, Education, and Welfare (1964a) reported that in 1963 the combined federal, state, and local expenditure for T & I education was $94 million. Of this, 12 per cent were federal funds, 36 per cent state funds, and 52 per cent local contribution. This same department also reported (1964b) that in

fiscal year 1965 the federal allotment alone for all of vocational education would be $168.5 million with two-thirds of this coming from the Vocational Education Act. In addition, MDTA would provide $407 million for training. The U.S. Department of Health, Education, and Welfare (1965) reported that for fiscal year 1965 state matching funds for vocational education would amount to almost $234 million, twice the federal allotment for the states.

Wenrich (1962b) surveyed Michigan administrators operating local day trade and cooperative programs and discovered that if special reimbursement were withdrawn, only 16 per cent of the existing programs would be eliminated. In place of reimbursement for teachers' salaries, more than 70 per cent of the administrators wanted funds to assist in developing programs for special groups, for preparing instructional materials, for improving guidance programs, for purchasing shop equipment, and for operating areawide schools.

EVALUATION

Follow-Up Studies

It is interesting to begin this section by citing the rather defamatory position of Benson and Lohnes (1959) toward vocational education. These authors contended that vocational education does not increase individual productivity; furthermore, they contended that technological industry prefers academically-trained workers and that the vocational schools are producing a defective product. Consider this in the light of strong indications to the opposite described below.

For a period of about six years, prior to the passage of the Vocational Education Act, the North Atlantic Region conducted evaluative

follow-up studies of graduates of high school trade and industrial programs in the region. They reported that in 1963 72 per cent of the graduates of day T & I programs, available for employment, were employed in jobs related to their training; this was true of 90 per cent of the cooperative T & I program graduates. Combined employment in both training-related and unrelated jobs was in the vicinity of 96 per cent for each program. Comparable placement data are reported for 1962 and 1961 as well; 1963 graduates were reported to be earning a median hourly wage of $1.54 to start, as compared to starting median hourly wages of $1.51 and $1.46 for 1962 and 1961 graduates, respectively (North Atlantic Region, 1963, 1964, 1965). Impressive placement data collected by the North Atlantic Region was an important stimulant for federal legislation in vocational education.

Eninger (1965) collected follow-up data from a national sample of graduates of high school T & I programs and non-college bound graduates of high school academic programs after two, six, and 11 years. T & I graduates took significantly less time to find their first full-time job after graduation than academic graduates and experienced fewer periods of unemployment after graduation. T & I graduates also experienced fewer job changes after graduation and obtained higher earnings after two and six years out of school when compared to academic graduates. By 11 years after graduation, they had evened out. Dispelling the popular myth that vocational education does not provide education for the "whole person," Eninger found that T & I graduates and non-college-going academic graduates had similar conversational interests, similar leisure-time activities, and similar organizational affiliations. They were also similar in attitudes toward school and

job satisfaction. Eninger's data comparing placement of those T & I graduates from vocational high schools and those from comprehensive high schools has already been presented (see Student Personnel Services - Placement).

Data reported by Flanagan et al. (1962) for Project Talent indicated that vocational high school facilities do not differ in any great respect from academic and comprehensive high school facilities in a national sample. While vocational high schools are in a relatively favorable position on student/teacher ratio, they are in a relatively unfavorable position on accreditation. Students of vocational high schools were found to (1) live in industrial areas, (2) come from homes where a language other than English was spoken, (3) come from strong ethnic backgrounds, (4) have high absenteeism, drop-outs, and legal offenses to a greater extent than students of academic and comprehensive high schools. Vocational teachers and administrators were found to have less formal education than their academic counterparts.

Nelson et al. (1960; see also Coster et al., 1960) used a list of general purposes of industrial education which a national jury had generated to evaluate high school T & I and industrial arts programs in terms of the purposes to which each program subscribed and the operational effort expended to attain each of its purposes. The findings revealed that general purposes of industrial education are more effectively attained through the operational activities of T & I teachers as opposed to industrial arts teachers.

Coe and Zanzalari (1964) conducted a follow-up study of graduates of the Middlesex County, New Jersey, Vocational Technical High Schools 10 years after graduation. Eighty per cent of the male

respondents were employed earning a mean hourly wage of $2.80. Sixty per cent of those available for employment were still working in the trade for which they had been trained. One-quarter of the graduates had attained foreman or superintendent positions. The State of New Jersey (1964) reported that 86 per cent of the graduates of day T & I programs had received immediate placement in the trade for which they had been trained (provided they were available for employment) at a median hourly wage of $1.69 to start. Gatch (1963) followed up graduates of the Newton, Iowa, High School machine shop program after 10 years and found that 69 per cent were using machine shop training to earn a living. Mattke (1965) followed up T & I graduates of Davenport, Iowa, high schools over a three-year period and found almost 55 per cent working in the occupation for which they had been trained or a closely related one. Ryerkerk (1965) followed up graduates of the T & I program in Mason City, Iowa, after from five to 15 years and found that 78 per cent had never been unemployed. About 36 per cent were still employed in the job area for which they were trained. Moss (1962) followed up a small group of T & I graduates and graduates of other programs in a redevelopment area of Missouri and found no differences in initial placement, initial wages, or wages three years later. Hunter (1963) found that only a small percentage of graduates of vocational programs in a section of Missouri were employed in the field for which they received training. However, the geographical area called for skilled tradesmen and most of the vocational programs in the local high schools were in agriculture, business education, and home economics.

Evaluation Techniques

Sweany (1966) recommended planned, continuous evaluation of vocational programs, primarily in terms of graduate placement but also in terms of (1) teaching support functions (e.g., administration, counseling, curriculum planning), (2) quality of the program, (3) availability to all students, (4) adequacy of coverage of different fields, (5) changes required in keeping up to date, (6) effectiveness of teaching methods, (7) efficiency of learning, (8) comparative costs of programs, and (9) use of funds. Smalley (1965) suggested the following questions be asked relative to program evaluation: (1) what kinds of students take industrial education courses? (2) what are former students doing now? (3) what is being done with some of the latest educational developments? (4) what relationship exists between objectives and evaluation? (5) what groups of students should industrial education serve? (6) how do we compare with other schools? (7) what is the image of industrial education?

Two specific instruments for evaluating T & I programs appeared in the literature (University of the State of New York, 1962. Ohio Trade and Industrial Education Service, 1964). Both required subjective appraisals by administrators and educators on a lengthy set of structured questions. Two course-specific evaluative devices have also been found: Hill's (1964) technique for automotive mechanics and Schilling's (1965) technique for drafting.

Finally, Tuckman (1965) recommended the use of structured, content-validated tests to determine whether course objectives have been met. This would serve as a basis for evaluation when immediate decisions must be made and the luxury of a follow-up study is not afforded.

The development of evaluative techniques and devices other than the follow-up study (which is well-developed and widely used) is encouraged as an aid to the field of trade and industrial education.

RESEARCH

Rivlin (1965) concluded her treatise on critical issues in the development of vocational education with the following statement:

> To sum up, one thing that is clearly wrong with vocational education is that we know so little about it. We badly need information about costs of alternative methods of training and about the income and employment histories of graduates. We need far more experimentation with new methods of teaching, new ways of combining classroom instruction and on-the-job training, and new methods of financing occupational training. We also need to examine the effects of local decision-making on the distribution of educational resources and to develop methods of transmitting the skill needs of the nation to local schools and individual students. (pp. 165-166)

Many other research-oriented vocational educators have attempted to identify needed types of research and timely research problems such those above. Brandon and Evans (1965) identified six categories of research: (1) basic scientific investigation (content indifferent), (2) basic scientific investigation (content relevant), (3) investigation of educationally-oriented problems, (4) classroom experimentation, (5) field testing, and (6) demonstration and dissemination. They encourage vocational researchers to directly pursue categories three through six but realize that studies in the first two categories must be available to build on. An excellent example of how vocational education might borrow from the social sciences to fulfill categories one and two is offered by Drabick (1965). VanderWerf (1965) suggested five research categories to be pursued which basically fall into

the areas of manpower policies (opportunities and talents), educational preparation for occupations, organizational structure, recruitment, selection and preparation of teachers, and vocational behavior (development and guidance).

Perhaps the most definitive source on the subject, the U.S. Department of Health, Education, and Welfare (1965c), has identified the following seven research priority areas for vocational education: (1) program evaluation, (2) curriculum experimentation, (3) personal and social significance of work, (4) personnel recruitment and development, (5) program organization and administration, (6) adult and continuing education, and (7) occupational information and career choice.

Courtney (1966) surveyed vocational school directors to discover crucial problems within their institutions needing research. While agreement was meager, the following problem areas emerged: present and emerging occupations, necessary occupational competencies, factors affecting motivation of the socio-economically handicapped, improvement of community attitudes, and factors affecting decisions to move.

Moss (1964) recommended that researchers assign priority to current problems if results are to have any immediate usefulness. Persistent problems are also to be assigned a high priority.

Research undertakings require financial support and Rowlett (1964c) outlined a procedure for securing such support and a list of likely sources. It is his contention that the necessary conditions for research in the field of vocational education--problems, personnel, financial support, and interest by professional organizations--all do exist at this time.

Spence (1964) examined 800 graduate theses completed during the period from 1892 to 1933. He concluded that we are still trying to solve the same problems even though our technology has changed considerably.

One must conclude with a general indictment of the vocational education profession concerning the area of research. The last time an issue of the Review of Educational Research was devoted to research in vocational education was in October, 1962, almost four years ago. Since that time, presumably, enough published research has not been done to fill an issue. In that 1962 issue, Karnes (1962) reviewed the area of industrial education and concluded that most of the research was characterized by documentary and descriptive procedures. Furthermore, major studies to test the organization and curriculum patterns of programs had not been undertaken. He recommended the task force or team approach to major research undertakings. In that same issue, Wenrich, Swanson, and Evans (1962) reviewed research in vocational, technical, and practical arts education. They identified most of the research they reviewed as having been done by graduate students and subject matter specialists, rarely by professional researchers. The majority of the 39 studies they reviewed were subject-matter oriented. Moreover, at the last national meeting of the American Educational Research Association, only two out of about 100 sessions were devoted to research in vocational education.

That was in 1962. In 1966, there are information centers for vocational education, regional laboratories, numerous sources of funds. Lists of funded proposals made available by the Bureau of Adult and Vocational Research of the U.S. Office of Education indicate that

more research than ever before is being done in vocational education. Certainly organizational support is not lacking. Vocational educators cannot depend on researchers in the other fields of education to provide either the answers to specific questions or a broad-based set of theoretical constructs for use in vocational education. Where the programs are different, the students different, the teachers different, and many of the objectives different, the research must come from within the field in question by persons equally versed in the concepts and practices of that field and the methods and techniques of research. Part of the answer lies in attracting individuals from other disciplines to vocational education, but the primary answer lies in having a "farm system"; the graduate departments of vocational-technical education across the country must turn out research-oriented, research-talented individuals at the doctoral level to help fill the gap and elevate the position of vocational research to a level appropriate for its social importance and equal to its existing problems.

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BIBLIOGRAPHY

Agan, R. J. "Kansas School Administrators Take a Look at Vocational Education." American Vocational Journal 35: 23-24: March 1960.

Allen, David. "Trade Technical Teacher Education in California: Experimentation, Innovation, Redirection." Journal of Industrial Teacher Education 1: 15-19: Spring 1964.

Altman, James W. "General Vocational Capabilities (Skills and Knowledges." Paper presented at American Educational Research Association Meeting, Chicago, February 1966.

Arnold, Walter M. "New Direction in Vocational Education." American Vocational Journal 39: 8-12; October 1964.

Benson, Charles S., and Lohnes, Paul R. "Public Education and the Development of Work Skills." Harvard Educational Review 29: 137-150; Spring 1959.

Bentley, R. R., and Rempel, A. M. The Relationship of Selected Factors to Teacher Morale. Lafayette, Ind.: Purdue University, 1962. 10 pp.

Borow, Henry. "Research Programs in Career Development." Journal of Counseling Psychology 7: 62-70; Spring 1960.

Borow, Henry. "Vocational Development Research: Some Problems of Logical and Experimental Form." Personnel and Guidance Journal 40: 21-25; September 1961.

Bowman, Elaine B. "Authoritarian-Democratic Attitudes of Academic and Vocational Teachers." Journal of Industrial Teacher Education 3: 47-53; Winter 1966.

Bowser, James A. Curriculum and Other Implications Resulting from a Study of the Graduates and Drop-Outs of the Terminal and Vocational Industrial Education Program at the Norfolk Division of Virginia State College, 1950-1954. Doctor's thesis. University Park, Pa.: The Pennsylvania State University, 1960. 200 pp.

Boyd, Robert A. "Light: Its Effect on Teaching and Learning." School Shop 22: 39-40, 116-117; April 1963.

Brandon, George L., and Evans, Rupert N. "Research in Vocational Education." Vocational Education. Sixty-Fourth Yearbook, Part I, National Society for the Study of Education. Chicago: The Society, 1965. Chapter 12, pp. 263-279.

Brantner, Seymour T. An Appraisal of Selected Courses of the Vocational Trade and Industrial Teacher Education Curriculum in Pennsylvania. Doctor's thesis. Pittsburgh, Pa.: University of Pittsburgh, 1962.

Brantner, Seymour T. Trade and Technical Teachers' Opinions on Inservice Education. University Park, Pa.: The Pennsylvania State University, 1964. 86 pp.

Brantner, Seymour T., and Schaefer, Carl J. A Comparative Study of Reproduction Methods for Teacher Prepared Student Assignment Sheets. University Park, Pa.: The Pennsylvania State University, 1962. 16 pp.

Brown, B. Wesley. Characteristic Differences of Trade School Students and Their Bearing on Post-School Occupational Plans. Doctor's thesis. Columbia, Mo.: University of Missouri, 1960. 192 pp.

Brown, George J. Manipulative Operations and Electronic Equipment Needed in Industrial Teacher Education Based on Industrial Practices. Doctor's thesis. Columbia, Mo.: University of Missouri, 1960.

Brown, Walter C. "Inservice Teacher Education in Phoenix." Industrial Arts and Vocational Education 52: 14: June 1963.

Bugher, W. K. An Evaluation of the Superintendent's Concept of and Impact on Selected Aspects of Vocational Programs. Doctor's thesis. Lafayette, Ind.: Purdue University, 1960. 172 pp.

Burchill, G. W. Work-Study Programs for Alienated Youth: A Casebook. Chicago, Ill.: Science Research Associates, 1962. 265 pp.

Burt, Samuel M. "Aptitude Test for Selection of Vocational-Technical School Printing Students." American Vocational Journal 38: 23: November 1963.

Cambell, Doak S. The Florida Study of Vocational-Technical Education. Tallahassee, Fla.: State Department of Education, 1965. 129 pp.

Campion, Howard A. "The Establishment: The Power Structure of School and Community." School Shop 24: 62-63, 112: April 1965.

Caplow, T. The Sociology of Work. Minneapolis, Minn.: University of Minnesota Press, 1954.

Chaplin, Jack W. "A Theory for Experimental Research in Industrial Education Curriculum Development." Journal of Industrial Teacher Education 2: 30-39: Fall 1964.

Chase, Edward T. "Learning to be Unemployable." Harpers Magazine 226: 33; April 1963.

Coe, Burr D., and Zanzalari, J. Henry. After Ten Years - A Ten Year Follow-Up of Middlesex County Vocational and Technical High School Graduates. New Brunswick, N.J.: Middlesex County Vocational and Technical Schools, 1964, pp. 1-8.

Colver, Robert M. "The Importance of Student Selection for Quality Instruction." American Vocational Journal 36: 15-17, 25 May 1961.

Connecticut Department of Education. Professional and Industrial Activities of Vocational-Technical Teaching Staff. Hartford, Conn.: Department of Education, 1963.

Corazzini, A. J. "When Should Vocational Training Begin?" Paper presented at a conference sponsored by The Center for Studies in Vocational and Technical Education, University of Wisconsin, June 1966.

Cornwall, Raymond L. Written Instructional Materials: An Experimental Comparison of Problem-Centered and Traditional Assignment Sheets. Doctor's thesis. Minneapolis, Minn.: University of Minnesota, 1961.

Cory, Edward D. A Proposed Program in Industrial Education for the Academically Talented Student. Doctor's thesis. Ames, Iowa: Iowa State University, 1964.

Coster, John K., Nelson, N. J., and Woerdehoff, F. J. A Bidimensional Approach to Educational Appraisal. Lafayette, Ind.: Purdue University, Studies in Education No. 3, 1960. 34 pp.

Courtney, E. Wayne. Research Needs in Vocational-Technical Education. Menomonie, Wis.: Stout State University, 1966. 47 pp.

Crawford, Margaret L. "Selection and Guidance of Students for Technical and Vocational Education." American Vocational Journal 39: 14-15, 32; April 1964.

Crawford, Margaret L. "Available Tests and Their Use in Research in Vocational Education." Paper read at National Seminar on Research in Vocational-Technical Education, Colorado State University, March 1966.

Courtney, E. Wayne. Implications for the Training of Teachers: Professional Education Preparation and Requirements. Menomonie, Wis.: Stout State University, 1965. 89 pp.

Dade County Public Schools. A Partial List of Competencies in the Areas of the Communication Arts, Mathematics, and the Physical Sciences Required of Students Enrolled in Vocational Education

Programs at the Secondary School Level. Miami, Fla.: Division of Vocational, Technical, and Adult Education, 1965. 27 pp.

Dauwalder, Donald D. Vocational Education in the Pittsburgh Public Schools. Pittsburgh, Pa.: Pittsburgh Board of Public Education, 1963. 76 pp.

Drabick, Lawrence W. "Research in Other Fields Offers Help for Education." American Vocational Journal 40: 31-33; April 1965.

Drew, Alfred S. The Relationship of General Reading Ability and Other Factors to School and Job Performance of Machinist Apprentices. Doctor's thesis. Madison, Wis.: University of Wisconsin, 1962.

Drew, Alfred S. "The Relationship of General Reading Ability and Other Factors to School and Job Performance of Machinist Apprentices." Journal of Industrial Teacher Education 2: 47-60; Fall 1964.

Dull, L. W. Criteria for Evaluating the Supervision Program in School Systems. Doctor's thesis. Columbus, Ohio: The Ohio State University, 1960. 446 pp.

Dunton, William K. "There's a Job for All Who Can Be Trained." School Shop 23: 48-51; April 1964.

Eddy, Laurence W. "The Elements of an Effective Program of Trade Theory." Industrial Arts and Vocational Education 52: 16-17; October 1963.

Eddy, Max. "A Satire: The Spirit of Vocational Education." Journal of Industrial Teacher Education 1: 17-20; Winter 1963.

Eninger, Max U. The Process and Product of T & I High School Level Vocational Education in the United States: The Product. Pittsburgh, Pa.: American Institutes for Research, 1965.

Fagan, Bernard T. A Survey of Trade and Industrial and Distributive Education Teachers in Kentucky and Their Concerns Relative to the Program of Teacher Education. Lexington, Ky.: Vocational Education, Trade and Industrial Educational, University of Kentucky, 1960. 76 pp.

Feirer, John L. "Content or Method." Industrial Arts and Vocational Education 50: 11; February 1961.

Ferguson, John L., and Dickey, Frank G. "Career Planning, Job Placement and Follow-Up." Review of Educational Research 32: 377-383; October 1962.

Fitts, Paul M., Jr. "The Human Factor in Safety and Design." School Shop 22: 45-47; April 1963.

Flanagan, John C. Research in the Relationship Between Choice of High School Curriculum and Important Educational and Occupational Outcomes. Project submitted to the U.S. Commissioner of Education, 1963.

Flanagan, John C., Dailey, John T., Shaycoft, Marion F., Orr, David B., and Goldberg, Isadore. Project Talent: A Survey and Follow-Up Study of Educational Plans and Decisions in Relation to Aptitude Patterns - Studies of the American High School. Pittsburgh, Pa.: University of Pittsburgh, Cooperative Research Project No. 226, 1962.

Foley, John P., Jr. Functional Fundamentals Training for Electronic Maintenance Personnel. Wright - Patterson Air Force Base, Ohio: Behavioral Sciences Laboratory, 1964. 49 pp.

Folley, John D., Jr. A Preliminary Procedure for Systematically Designing Performance Aids. Pittsburgh, Pa.: American Institutes for Research, 1961. 34 pp.

Folley, John D., Jr., Bouck, Aubrey J., and Foley, John P., Jr. A Field Experimental Study of Programed Instruction on a Manipulative Task. Wright - Patterson Air Force Base, Ohio: Behavioral Sciences Laboratory, 1964. 39 pp.

Foote, R. P. The Prediction of Success in Automotive Mechanics in a Vocational-Industrial Curriculum on the Secondary School Level. Doctor's thesis. New York: New York University, 1960. 305 pp.

Frye, Ronald M. A Vocational and Educational Follow-Up of Drop-Outs and Graduates of Hickman High School, Columbia, Missouri. Doctor's thesis. Columbia, Missouri: Department of Industrial Education, University of Missouri, 1962. 29 pp.

Fulmer, John L., and Green, Robert E. Analysis of Georgia's Technical, Skilled, and Clerical Labor Requirements and Training Needs, 1962 to 1967. Atlanta, Ga.: Department of Labor, 1963. 147 pp.

Gallington, Ralph O. High School Drop-Outs: Fate-Future-Identification. Carbondale, Ill.: Southern Illinois University, Project OE 5-85-005, 1966(a). 43 pp.

Gallington, Ralph O. Experimental and Demonstration Project in Vocational Education: An Interim Report. Carbondale, Ill.: Southern Illinois University, 1966(b). 30 pp.

Gatch, Wesley L. An Evaluation of the Machine Shop Program in the Newton Community High School, Newton, Iowa. Doctor's thesis. Ames, Iowa: Iowa State University, 1963.

Giachino, J. W. "Selecting Industrial Education Teachers." Industrial Arts and Vocational Education 50: 66; May 1961.

Gilliland, John W. "Sound: Its Effect on Teaching and Learning." School Shop 22: 41-42, 80; April 1963.

Ginther, Richard C. An Analysis of and Opinions Concerning Graduate Programs in Industrial Education. Doctor's thesis. Columbia, Missouri: University of Missouri, 1964.

Ginzberg, Eli, Ginsburg, S. W., Axelrod, S., and Herma, J. L. Occupational Choice. New York: Columbia University Press, 1951.

Griess, Jerald A. Selection of Trainees for a Twelve-Week Pre-Occupational Basic Education Program. Doctor's thesis. University Park, Pa.: The Pennsylvania State University, 1966.

Hagemeyer, R. H. Apprenticeship Selection Practices in Michigan's Manufacturing Companies. Doctor's thesis. Detroit, Mich.: Wayne State University, 1961.

Harris, Norman C. "Redoubled Efforts and Dimly Seen Goals." Phi Delta Kappan 46: 360-365; April 1965.

Haskew, Laurence D., and Tumlin, Inez W. "Vocational Education in the Curriculum of the Common School." Vocational Education. Sixty-Fourth Yearbook, Part I, National Society for the Study of Education. Chicago: The Society, 1965, Chapter 4, pp. 64-87.

Havinghurst, Robert. "Research on the School-Work Study Prevention of Juvenile Delinquency." Role of the School in the Prevention of Juvenile Delinquency. Washington, D.C.: U.S. Office of Education, Cooperative Research Program Monograph No. 10, 1963, pp. 27-45.

Hill, Harry G. "Automotive-Course Evaluation Sheet." School Shop 24: 31; October 1964.

Hoffman, Richard L. "The Social Environment of the School Shop." School Shop 22: 48-51, 117; April 1963.

Hooker, Clifford P. "The Individual and His Environment." School Shop 22: 32-33; April 1963.

Householder, Daniel L., and Seuss, Alan R. "Social Psychology in Action: Opinion Change in Industrial Education." Journal of Industrial Teacher Education 2: 25-29; Winter 1965.

Hull, Thomas F. "The Effect of Practice on the Performance of Task Analyzed Operations." Journal of Industrial Teacher Education 3: 4-9; Fall 1965.

Hunter, Elvin Max. Need For, Interest In, and Means of Supporting an Area Vocational School to Serve Miller, Monteau, and Morgan Counties, Missouri. Doctor's thesis. Columbia, Missouri: Department of Industrial Education, University of Missouri, 1963. 22 pp.

Impellitteri, Joseph T. An Analysis of the Occupational Competency Evaluation Program at the Pennsylvania State University from 1944 to 1965. University Park, Pa.: The Pennsylvania State University, 1965. 19 pp.

Iverson, Ralph G. "People: The Vitality of Environment." School Shop 22: 52-54, 108-109; April 1963.

Johnson, Marvin E. Practices in the Selection of Apprentices for Training and Their Relation to the Completion Rate. Doctor's thesis. Columbia, Missouri: University of Missouri, 1959. 208 pp.

Jonas, L. K. "Effective Instruction is Effective Communication." American Vocational Journal 37: 14, 15, 28: September 1962.

Karnes, John W. "Industrial Education." Review of Educational Research 32: 402-410; October 1962.

Keller, F. J. Vocationally Talented Pupils. New Brunswick, N.J.: Cooperative Research Project #1038, Rutgers - The State University, Division of Field Studies and Research, 1962.

Kynard, A. T. Criterion for Determining the Value of Work Experience for Teachers of Trade and Industrial Education. Doctor's thesis. Los Angeles, Calif.: University of California, 1960.

Langerman, Philip D. The Occupational Adjustment of 106 Releases from the Iowa Training School. Doctor's thesis. Ames, Iowa: Iowa State University, 1963.

Larson, Milton E. Technology-Resource Center for Vocational-Technical Education. New Brunswick, N.J.: Rutgers - The State University, 1965. 36 pp.

Larson, Milton E. "TRC Meets the Challenge of Change." American Vocational Journal 41: 12-13; April 1966.

Leonard, George B. "Are We Cheating Twenty Million Students?" Look Magazine 27: 37-48; June 4, 1963.

Lewin, Kurt, Lippitt, Ronald, and White, Ralph K. "Patterns of Agressive Behavior in Experimentally Created 'Social Climates.'" Journal of Social Psychology 10: 271-299; Fall 1939.

Littrell, J. J. "Are Student Teachers Exploited?" School Shop 24: 40; March 1965.

Lockette, Rutherford E. "What Research Has to Say for Content in Industrial Education." Journal of Industrial Teacher Education 2: 11-24; Spring 1965.

London, H. H. "Leaders for Vocational Education." School Shop 24: 56-57, 109; April 1965.

Loveless, Austin G. Background and Economic Status of the Unemployed of St. Francis County, Missouri, and Their Attitudes Towards Retraining. Doctor's thesis. Columbia, Missouri: University of Missouri, 1962. 170 pp.

Luv, Jack A. Backgrounds, Occupational Aspirations and Attitudes of Unemployed Youth in a MDTA Program in St. Louis, Missouri. Doctor's thesis. Columbia, Missouri: University of Missouri, 1964. 185 pp.

Lytle, Robert B., Jr. "Color: Its Effect on Teaching and Learning." School Shop 22: 43-44, 88-90; April 1963.

MacConnell, James D. "Integrating Industrial Education With the Total School Program." School Shop 22: 34-36; April 1963.

MacDonald, James B. "Curriculum Theory and Development in Vocational Education." Paper presented at American Educational Research Association Meeting, Chicago, February 1966.

Maley, Donald, and Frantz, Nevin R. An Investigation and Development of the "Cluster Concept" as a Program in Vocational Education at the Secondary School Level. College Park, Md.: University of Maryland, 1965.

Manchak, Paul J. "Closed Circuit T.V. and Industrial Education." School Shop 22: 21-23, 26, October 1962.

Mason, C. C. A Study of Organization for the Administration of Vocational Education in Selected Michigan High Schools, A Summary Report. Ann Arbor, Mich.: University of Michigan, Office of Research Administration, 1963. 17 pp.

Mathews, F. H. A Study of the Perceptions of the Role of the Local Director of Vocational Education. Specialist's thesis. Ann Arbor, Mich.: University of Michigan, 1963. 120 pp.

Mattke, Keith D. The Occupational Status of Vocational Day Trade Graduates from the Davenport Community Schools, Davenport, Iowa, for the Years 1960, 1961, and 1962. Master's thesis. Ames, Iowa: Iowa State University, 1965.

McCall, John N. "Trends in the Measurement of Vocational Interests." Review of Educational Research 35: 53-62; February 1965.

McComas, J. D., and Willey, D. S. "Planning Programs to Fit Personnel or Fitting Personnel to Plan Programs." American Vocational Journal 41: 38-39; March 1966.

McDowell, L. C. "Vocational Education and Changing Needs." Bulletin of The Bureau of School Service of Kentucky 38: Whole No. 1: Sept. 1965.

McLure, William P., Mann, George C., Hamlin, Herbert M., Karnes, M. Ray, and Miller, P. Van. Vocational and Technical Education in Illinois: Tomorrow's Challenge. Urbana, Ill.: University of Illinois, 1960.

Micheels, William J. "Why All the Fuss About Shop Environment?" School Shop 22: 55-56; April 1963.

Micheels, William J. "Observations on In-Service Teacher Education." Industrial Arts and Vocational Education 54: 17-19; June 1965.

Miller, W. R. "Reconciling Basic Teaching Methods and Problem Solving." School Shop 24: 13-14, 41, January 1965.

Moeller, Carl A. Aims for Undergraduate Industrial Teacher Education: A Study of Projected Aims and Supporting Principles as Evaluated by Selected Representatives of Labor and Industry. Doctor's thesis. Detroit, Mich.: Wayne State University, 1961.

Moore, Darrell G. A Survey of Basic Drawing Needs of High School Students as Reported by Engineers and Draftsmen. Doctor's thesis. Ames, Iowa: Iowa State University, 1961.

Morine, John P., Nangle, Grace L., and Burke, James L. Quincy Trade and Technical School Survey. Boston, Mass.: Department of Education, Division of Vocational Education, 1964. 91 pp.

Moss, Jerome, Jr. An Experimental Study of the Relative Effectiveness of the Direct-Detailed and the Direct Discovery Methods of Teaching Letterpress Imposition. Doctor's thesis. Urbana, Ill.: University of Illinois, 1960. 280 pp.

Moss, Jerome, Jr. A Preferred Order for Studying Current Problems in Minnesota's Trade and Technical Program. Minneapolis, Minnesota: University of Minnesota, 1964. 22 pp.

Moss, Jerome, Jr. "A Review of Research in the Administration and Supervision of Industrial Education." Journal of Industrial Teacher Education 2: 5-24; Winter 1965.

Moss, J. F. A Follow-Up of Drop-Outs and Graduates of Schools in a Redevelopment Area With Implications for Vocational Education. Doctor's thesis. Columbia, Mo.: University of Missouri, 1962.

National Education Association. Automation and the Challenge to Education. Washington, D.C.: National Education Association, 1962.

National Education Association. "Education and Income." NEA Research Bulletin 41: 42-44; May 1963(a).

National Education Association. Schools for the Sixties. New York: McGraw-Hill, 1963(b). 146 pp.

Nelson, N. J., Woerdehoff, F. J., and Coster, John K. Vocational Education in Public Schools as Related to Social, Economic, and Technical Trends: Part II, The Appraisal of Programs of Vocational Agriculture and Industrial Education. Lafayette, Ind.: Purdue University, Studies in Education No. 2, 1960. 619 pp.

North Atlantic Region. Follow-Up Study, 1961 Graduates, Trade and Industrial Programs in Public Vocational and Technical High Schools. Washington, D.C.: U.S. Office of Education, 1963. 61 pp.

North Atlantic Region. Follow-Up Study, 1962 Graduates, Trade and Industrial Programs in Public Vocational and Technical High Schools. Washington, D.C.: U.S. Office of Education, 1964. 47 pp.

North Atlantic Region. Follow-Up Study, 1963 Graduates, Trade and Industrial Programs in Public Vocational and Technical High Schools. Washington, D.C.: U.S. Office of Education, 1965. 60 pp.

Nunnery, Michael Y., and Sharp, Bert L. "Nature of Vocational Choice." American Vocational Journal 38: 9, 10, 29; October 1963.

O'Brien, Emmett. "Development of Vocational-Technical Schools in Connecticut." Education and Training for the World of Work. (Edited by Harold T. Smith.) Kalamazoo, Mich.: The W. E. Upjohn Institute for Employment Research, 1963. Chapter 6, pp. 49-55.

O'Brian, John L. The Advanced Degree and Vocational-Technical Education Leadership. New Brunswick, N.J.: Rutgers - The State University, 1966. 52 pp.

O'Brian, John L., and Schaefer, Carl J. "A Review of Research in Trade and Industrial Teacher Education." Paper presented at the National Invitational Research Planning Conference on Trade and Industrial Teacher Education, Atwood Lake, Ohio, June 1966.

Ohio Department of Education. Meeting Ohio's Needs for Vocational and Technical Education. Columbus, Ohio: Division of Vocational Education, Ohio Department of Education, 1957. 145 pp.

Ohio Trade and Industrial Education Service. Trade and Industrial Education Program Analysis Questionnaire. Columbus, Ohio: The Ohio State University, 1964.

Olivo, Thomas C. "Curriculum Planning: The Basis for Program Development." School Shop 23: 43-45, 117; April 1964.

Olivo, Thomas C. "A Leadership Training Breakthrough for the New Vocational Training." School Shop 24: 54-55, 110-112; April 1965.

Pankowski, Dallas. "A Guide for the Development of Motor Skills." Industrial Arts and Vocational Education 54: 246-56; February 1965.

Parks, Gerald A. "Circumstances Surrounding Situs Moves of Certain Tradesmen Into Industrial Vocational Teaching." Journal of Industrial Teacher Education 3: 10-20; Fall 1965.

Pragan, Otto. "Labor's Stake in Vocational Education." American Vocational Journal 40: 13-14, 32; March 1965.

Prichard, Neal W. A Critical Analysis of Selected Factors Affecting School Administrators' and School Board Members' Attitudes Toward Vocational Trade and Industrial Education in Pennsylvania. Doctor's thesis. University Park, Pa.: The Pennsylvania State University, 1962.

Pucel, David J., and Evans, Rupert N. "Manpower Economics and Vocational Education." American Vocational Journal 39: 18-19, 22: April 1964.

Ramp, Wade A. "Cooperative Trade Teacher Training, Trade and Industrial Teacher Training." American Vocational Journal 37: 30: March 1962.

Righthand, Herbert. "What Research Has to Say for Industrial Education: Philosophy and Objectives." Journal of Industrial Teacher Education 2: 5-15; Fall 1964.

Rivlin, Alice M. "Critical Issues in the Development of Vocational Education." Unemployment in a Prosperous Economy, A Report of the Princeton Manpower Symposium. (Edited by William G. Bowen and Frederick H. Harbison.) Princeton University Industrial Relations Section, Princeton, N.J., 1965, pp. 153-166.

Robertson, Von H. "Upgrading Instruction in Industrial Education." American Vocational Journal 40: 43-45; April 1965.

Rowlett, John D. "What Research Has to Say for Industrial Education: Improving Teaching." Journal of Industrial Teacher Education 1:20-30; Spring 1964(a).

Rowlett, John D. "A Summary of an Experimental Comparison of Direct-Detailed and Direct-Discovery Methods of Presenting Tape-Recorded Instruction." Journal of Industrial Teacher Education 1: 21-45: Winter 1964(b).

Rowlett, John D. "Sources and Procedures for Securing Financial Support for Research in Industrial Education." Journal of Industrial Teacher Education 1: 17-21; Fall 1964(c).

Ruch, Floyd L., and Ruch, William W. "Predicting Success in Draftsman Training With Short Time Limit Aptitude Tests." Educational and Psychological Measurement 20: 827-833; Winter 1960.

Rudiger, Robert E. "Teaching Motor Skills In-Depth in Vocational Areas." Industrial Arts and Vocational Education 54: 29-30: February 1965.

Rutgers, Norman L. "Heat: Its Effect on Teaching and Learning." School Shop 22: 37-38, 118; April 1963.

Ryan, Chester M. An Analysis of the Preparation Selection and Training of Teachers in the Trade and Industrial Education Program of North Carolina With Implications for the Future. Doctor's thesis. Chapel Hill, North Carolina: University of North Carolina, 1963.

Ryerkerk, Donald A. A Study of the Graduates of the Mason City, Iowa High School Trades and Industry Program. Master's thesis. Ames, Iowa: Iowa State University, 1965.

Schaefer, Carl J. Vocational Trade and Industrial Leadership: Its Measurement and Description. University Park, Pa.: The Pennsylvania State University, 1962(a).

Schaefer, Carl J. Pennsylvania's Trade and Industrial Education Image. University Park, Pa.: The Pennsylvania State University, 1962. 87 pp.

Schaefer, Carl J. "Mid-Twentieth Century T & I Needs: A New Breed of Teachers." School Shop 23: 11; November 1963(a).

Schaefer, Carl J. What Makes A Master Teacher. New Brunswick, N.J.: Rutgers - The State University, 1963(b).

Schaefer, Carl J. "The Old Sterotypes No Longer Apply to Job Training." School Shop 24: 60-61, 118: April 1965.

Schaefer, Carl J., and Prichard, Neal W. "Some Schools Short Change Students in Vocational Education." Journal of Industrial Teacher Education 1: 32-36: Fall 1963.

Schill, William J. "Career Patterns of Trade and Industrial Educators." Journal of Industrial Teacher Education 1: 51-55: Winter 1964(a).

Schill, William J. "What Knowledge is Most Useful?" School Shop 24: 21; December 1964(b).

Schill, William J. "Study of the Efficacy of Using Automated Instruction Devices in Teacher Training." Research project approved by the Occupational Research and Developing Coordinating Unit for Voc. Ed. in State of Illinois. (Completed June 7, 1965.)

Schilling, James L. "Orthographic Projection, A Key to Measuring Drafting Achievement." Industrial Arts and Vocational Education 54: 38-39; April 1965.

Seefeld, Kermit A. "Vocational Education in the Liberal Education Continuum." Industrial Arts and Vocational Education 53: 21-31: November 1964.

Sharp, Bert L., and Nunnery, Michael Y. "Assisting Students in Making Vocational Choices." American Vocational Journal 38: 21-32: November 1963.

Shemick, John M. A Study of the Relative Effectiveness in Teaching a Manipulative Skill - A Multi-Media Teaching Program Versus Classroom Demonstration With Printed Instruction Sheets. University Park, Pa.: The Pennsylvania State University, 1964. 20 pp.

Sheppard, Harold L., and Belitsky, Harvey. The Job Hunt: Job-Seeking Behavior of Unemployed Workers in a Local Economy. Washington, D.C.: W. E. Upjohn Institute for Employment Research, 1965.

Siegel, Arthur I., Richlin, Milton, and Federman, Philips. "A Comparative Study of 'Transfer' Through Generalization' and 'Transfer Through Identical Elements' in Technical Training." Journal of Applied Psychology 44: 27-30; February 1960.

Silvius, Harold G., and Ford, Andrew F. The Michigan Study of Industrial Teacher Competence. Detroit, Mich.: Wayne State University, 1965. 119 pp.

Sloane, Frank O. A Study of Drop-Outs, Dade County, Florida Public Schools, 1960-1963. Miami, Florida: Department of Research and Information, Dade County Public Schools, 1964. 124 pp.

Smalley, Lee H. "Evaluating Your Program." Industrial Arts and Vocational Education 54: 23; June 1965.

Smith, Harold T. Education and Training for the World of Work. Kalamazoo, Mich.: The W. E. Upjohn Institute for Employment Research, 1963.

Spence, William P. "Research in Industrial Education - A Look at the Past." Industrial Arts and Vocational Education 53: 56-58: December 1964.

Stadt, Ronald. "Criteria for Programing in Vocational Education." Industrial Arts and Vocational Education 52: 19-20, 54: 1963.

State of New Jersey. New Jersey Manpower Projections, 1960-1970. Trenton, N.J.: Department of Labor and Industry, 1961. 17 pp.

State of New Jersey, Department of Education. Follow-Up Study of Graduates of Vocational-Technical Education Programs, Class of 1964. Trenton, N.J.: Commissioner of Education, 1964. 40 pp.

State of New Jersey, Department of Education. Report on a Study to Determine the Trades in Which Apprentices are Employed and the Number of Employed Apprentices Enrolled in Related Instruction Classes. Trenton, N.J.: Commissioner of Education, March 1966. 16 pp.

State of Pennsylvania Research Advisory Committee. As You See It. Harrisburg, Pa.: Pennsylvania Department of Public Instruction, 1960. 4 pp.

Stern, Jacob. "Industrial Education and the Imperatives of the New Materials Age." Journal of Industrial Teacher Education 1: 11-14; Spring 1964.

Stout, John K. Instructor-Operated Educational T.V. Williamsport, Pa.: Williamsport Technical Institute, 1963. 59 pp.

Suess, Alan R. "The Effect of Manipulation on the Directed Discovery Method of Teaching Orthographic Projection Principles." Journal of Industrial Teacher Education 2: 42-49; Spring 1965.

Suess, Alan R. "The SNAFU Regarding Teaching Methods in Industrial Education." Journal of Industrial Teacher Education, 1966 (in press).

Super, Donald E. et al. Career Development: Self-Concept Theory. Princeton, N.J.: College Entrance Examination Board, 1963.

Swanson, Chester J. "Big Problems and Great Opportunities for Vocational-Education Leadership." School Shop 23: 46-47, 106; April 1964.

Swanson, Chester J., and Kramer, Ernest G. "Vocational Education Beyond the High School." Vocational Education. Sixty-Fourth Yearbook, Part I, National Society for the Study of Education. Chicago: The Society, 1965. Chapter 7, pp. 168-185.

Swanson, Wendell L. A Study of Superior Practices in Graduate Industrial Education at the Master's Level. Doctor's thesis. College Park, Md.: University of Maryland, 1964.

Sweany, H. P. "The National Assessment of Vocational Education." American Vocational Journal 41: 14-16; March 1966.

Teufner, Joseph L. "Inservice Teacher Education Programs." American Vocational Journal 36: 34; March 1961.

Tiedeman, D. V., O'Hara, R. P., and Baruch, R. W. Career Development: Choice and Adjustment. Princeton, N.J.: College Entrance Examination Board, 1963.

Tuckman, Bruce W. The Development and Testing of an Evaluation Model for Vocational Pilot Programs. A proposal submitted to and accepted by the U.S. Commissioner of Education. New Brunswick, N.J.: Rutgers - The State University, 1965.

Tuckman, Bruce W., and O'Brian, John L. Preparing Teachers to Teach the Disadvantaged. New York: Free Press (in preparation).

University of the State of New York. A Guide for the Review of a Program in Trade and Technical Education. Albany, N.Y.: State Education Department, Cooperative Review Service, 1962.

U.S. Department of Health, Education, and Welfare, Office of Education. Administration of Vocational Education. Vocational Education Bulletin, General Series, No. 1. Washington, D.C.: Government Printing Office, 1958.

U.S. Department of Health, Education, and Welfare. Education for a Changing World of Work. Report of the Panel of Consultants on Vocational Education. Washington, D.C.: U.S. Government Printing Office, 1963. 296 pp.

U.S. Department of Health, Education, and Welfare. Milestones in Education. Washington, D.C.: U.S. Government Printing Office, 1964(a). 43 pp.

U.S. Department of Health, Education, and Welfare. Vocational and Technical Education. A Review of Activities in Federally Aided Programs. Washington, D.C.: U.S. Government Printing Office, 1964(b). 68 pp.

U.S. Department of Health, Education, and Welfare. Summary Report of Vocational-Technical Program Development by States. Washington, D.C.: Office of Education, 1965(a). 50 pp.

U.S. Department of Health, Education, and Welfare. Summary of Report--on Bachelors and Higher Degrees Conferred During the Year 1963-64. Washington, D.C.: U.S. Government Printing Office, 1965(b). 10 pp.

U.S. Department of Health, Education, and Welfare. Guidelines for the Division of Adult and Vocational Research. Washington, D.C.: Office of Education, 1965(c). 13 pp.

U.S. Department of Health, Education, and Welfare. Education and Training - Passport to Opportunity. Washington, D.C.: U.S. Government Printing Office, 1966. 92 pp.

U.S. Department of Labor. Manpower-Challenge of the 1960's. Washington, D.C.: U.S. Government Printing Office, 1960. 24 pp.

U.S. Department of Labor. Manpower Research and Training Under the Manpower Development and Training Act. Washington, D.C.: U.S. Government Printing Office, 1964.

U.S. Department of Labor. Outlook for Numerical Control of Machine Tools. Washington, D.C.: U.S. Government Printing Office, Bulletin 1437, 1965.

U.S. Department of Labor. 1966 Manpower Report of the President and a Report on Manpower Requirements, Resources, Utilization, and Training. Washington, D.C.: U.S. Government Printing Office, 1966(a). 229 pp.

U.S. Department of Labor. "America's Industrial and Occupational Manpower Requirements." Supplement to Technology and the American Economy. (Prepared by the National Commission on Technology, Automation and Economic Progress.) Washington, D.C.: U.S. Government Printing Office, 1966(b).

U.S. Department of Labor. Technological Trends in Major American Industries. Washington, D.C.: U.S. Government Printing Office, Bulletin 1474, 1966(c).

U.S. Department of Labor. 1966 Report of the Secretary of Labor on Manpower Research and Training Under the MDTA. Washington, D.C.: U.S. Government Printing Office, 1966(d). 216 pp.

Vander Werf, Lester S. "Needed Research in Vocational Education." Phi Delta Kappan 46: 405-410; April 1965.

Van Tries, Robert P. "A Status Report on Industrial Education and Expansion: A Report on a Minnesota Survey." Industrial Arts and Vocational Education 53: 18-19, 65; December 1964.

Venn, Grant. Man Education and Work. Washington, D.C.: American Council Education, 1964.

Vezzani, A. A. "The Forgotten Individual - The Vocational Teacher: Finding, Training, and Qualifying Him." School Shop 24: 49-50, 116, 118; April 1965.

Waetjen, Walter B. "How We Learn." Industrial Arts and Vocational Education 53: 16-17; December 1964.

Walsh, John P. Teacher Competencies in Trade and Industrial Education. Washington, D.C.: U.S. Government Printing Office, OE 84006, 1960.

Walsh, John P. "Training - Manpower Utilization Catalyst." American Vocational Journal 38: 12-14; April 1963.

Walsh, John P., and Selden, William. "Vocational Education in the Secondary School." Vocational Education. Sixty-Fourth Yearbook, Part I, National Society for the Study of Education. Chicago: The Society, 1965. Chapter 5, pp. 88-134.

Walsh, Raymond J. Relationship of Enrollment in Practical Arts and Vocational Courses to the Holding Power of the Comprehensive High School. Doctor's thesis. Columbia, Mo.: University of Missouri, 1965.

Walz, Garry R. "Vocational Developmental Approach." Review of Educational Research 33: 197-204; April 1963.

Warner, James C. Employment Opportunities and Training Needs for Skilled Workers in the State of Missouri: With Projections Through 1970. Doctor's thesis. Columbia, Mo.: University of Missouri, 1962.

Weaver, Charles E. "Ohio Students Desire Vocational Education." American Vocational Journal 39: 12-13; May 1964.

Weller, J. C. W. "Training Objectives." Industrial Training Instruction 1: 59; May 1966.

Wenrich, Ralph C. A Study to Determine More Effective Ways of Using State and Federal Vocational Education Funds in the Further Developments of Vocational Teacher Education in Michigan. Ann Arbor, Mich.: University of Michigan, 1962(a). 25 pp.

Wenrich, Ralph C. A Study to Determine More Effective Ways of Using State and Federal Vocational Education Funds in the Further Development of Programs Operated by Local School Districts. Ann Arbor, Mich.: University of Michigan, Office of Research Administration, 1962(b). 103 pp.

Wenrich, Ralph C. The Need for Area Vocational Schools in Michigan. Ann Arbor, Mich.: University of Michigan, 1963. 25 pp.

Wenrich, Ralph C., and Crowley, Robert J. Vocational Education as Perceived by Different Segments of the Population. Ann Arbor, Mich.: University of Michigan, Cooperative Research Project #1577, 1964. 148 pp.

Wenrich, Ralph C., Swanson, Gordon I., and Evans, Rupert, N. "Vocational, Technical and Practical Arts Education." Review of Educational Research 32: 367-376, October 1962.

Whitten, B. C. An Investigation of the Validity of Selected Criteria for Admission to a Vocational High School. Doctor's thesis. University Park, Pa.: The Pennsylvania State University, 1961.

Willis, Benjamin C. "Vocational Education in the Years Ahead." School Shop 22: 15-16, 34-37: October 1962.

Wills, Vernon L. "Emphasizing Speed of Performance in Industrial Education." Phi Delta Kappan 46: 404: April 1965.

Wolfbein, Seymour L. "Employing the Next Generation." School Shop 24: 25-26, 56; February 1965.

Women's Bureau, U.S. Department of Labor. 1962 Handbook on Women Workers. Washington, D.C.: U.S. Government Printing Office, Women's Bureau Bulletin No. 285, 1963. 202 pp.

Wood, Albert R. "Update Your Thinking on Procedures for Servicing Automatic Equipment." Plant Engineering 18: 114-17: January 1964.

Yung, Eldon J. An Analysis of Graduates of Day-Trade Auto Mechanics Programs in Missouri in Terms of Selected Psychological Traits and Environmental Factors With Implications for Research. Doctor's thesis. Columbia, Mo.: University of Missouri, 1965. 161 pp.

Zanzalari, J. Henry. The Placement Service in New Jersey Vocational and Technical High Schools. Doctor's thesis. New Brunswick, N.J.: Rutgers - The State University, 1960(a). 230 pp.

Zanzalari, J. Henry. "Vocational Placement: A Cooperative Function." Industrial Arts and Vocational Education 49: 25: December 1960(b).

OTHER CENTER PUBLICATIONS

"Guidelines for State Supervisors in Office Occupations Education." 1965 Business Clinic

A Report of a National Seminar on Agriculture Education, "Program Development and Research.

"Guidance in Vocational Education." - Guidelines for Research and Practice.

"Research Planning in Business and Office Education."

"Evaluation and Program Planning in Agricultural Education."

"A Report of a National Seminar on Health Occupations Education Centers."

"A Report of a National Seminar on Cooperative Education."

A Report of "A National Leadership Seminar on Home Economics Education."

"Systems Under Development for Vocational Guidance." - A Report of a Research Exchange Conference.

"Guidelines in Cooperative Education."

"A Survey of Vocational Education Programs for Students with Special Needs."